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Corporate cash holdings and investment in South Africa surrounding the recent global financial crisis

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Corporate cash holdings and Investment in South Africa surrounding the recent global financial crisis.

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Abstract

This thesis examines corporate cash holdings and private investment in South Africa in the context of the recent global financial crisis. The relationship between corporate cash holdings and private investment has been widely studied in the literature. However, this topic has been the focus of much less research in the South African context. We firstly analyse cash holdings in respectively 13 mining firms and 10 retail firms surrounding the recent crisis. For this purpose, we make use of panel OLS with fixed and random effect models. We cover the period between 2001 and 2016 in our analysis. We observe different results. In the retail sector, firms initially have a high level of cash and appear as more resilient surrounding the crisis. We report a propensity to maintain steady activities despite the financial turmoil. In other words, retail firms continue to pay dividends and to invest. In the mining sector, we observe a propensity to reduce dividends payment and to use cash flow to pay costs. Accordingly, mining corporates contract their activities to save cash during the crisis and significantly reduce their investments after the shock. In this case, these firms reduce their business value. We thereafter depict investments sensitivity to cash and cash flow in both sectors after the crisis. To achieve this, we make use of a dummy variable to capture the post-crisis period. Our results are not significant. However, and considering the overall period without a dummy variable, we find a positive and statistically significant correlation between investments and cash flow in the mining sector. Hence, a cash or cash flow shortage significantly and negatively affects investments. We do not obtain significant results in the retail sector. Finally, we make use of a vector autoregressive model, an orthogonalized impulse response function, and variance decomposition, for a horizon of eight to depict investment reaction to a shock on cash flow. Results highlight a positive reaction of investments to a deviation in cash flow in the retail sector, while results are not significant in the mining sector. A standard deviation of cash flow induces a response of 0.02 on investments, while a standard deviation of investments induces a response of less than -0.01 on cash flow. The variance decomposition reports a variation of 28% on average in investments to a shock on cash flow in the retail sector, while the variation is of 10% in the mining sector. Our thesis shows the importance of internal financing resources to maintain steady activities surrounding a financial crisis.

Key words: subprime crisis, South Africa, cash holdings, investment, panel OLS, multivariate time series.

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Introduction

The financial crisis of 2007-2009 affected advanced and developing economies. South Africa faced a global economic recession, including a significant decline in employment, consumption, investment, or more globally, economic activities. Furthermore, the distortion of prices and the global uncertainty on financial markets significantly and negatively affected firms. In developing economies, the crisis induced a decline in external financing access for companies and therefore, obliged them to save cash to resist the financial turmoil (Danso and Adomako, 2014; Kahle and Stulz, 2012; Moroke et al. 2014; Ncube et al. 2016; Shiau et al. 2018; Verick, 2012).

In the theoretical part of this thesis, we firstly discuss macroeconomic consequences of the financial crisis in South Africa. To report macroeconomic disturbances, we make use of the Hodrick-Prescott (1997) filter and we perform cyclical components. We also plot the trend of the policy rate, government expenditures and revenue. Moreover, we depict the two main transmission channels of the crisis. The former is the trade channel. South Africa mainly exports and imports to Europe, the United States, and China. Therefore, an economic shock can be transmitted through international trade and affect economic actors, especially firms (Naudé, 2009, Ncube et al. p. 68). The latter is the financial channel. Since the beginning of the 21st century, South Africa has liberalized financial markets. Therefore, foreign investments from the US and Europe have increased. In addition, financial markets became important for companies in order to finance their activities through equity. However, a financial shock can also be transmitted through this channel and could inhibit firms to raise funds (Ncube et al. 2016, p. 68). We conclude this first section by reporting the monetary and government response of South African institutions. More specifically, we examine their difficulty in applying efficient policies to support firms (Matemimola et al. 2015; Steytler and Powell, 2010). Secondly, we depict cash holdings surrounding a crisis. Most empirical research investigates corporate cash holdings in European countries (e.g., Bigelli and Shanchez-Vidal, 2010; Boubaker et al. 2015; Drobetz and Grüninger, 2007; Ferreira and Vilela, 2004; Fischer et al. 2014; Joseph et al. 2020; Ozkan and Ozkan, 2004; Pinkowitz and Williamson; 2001; Uyar and Kuzey, 2013), in the United States (e.g., Bates et al. 2009; Kim et al. 1998; Opler et al. 2019) or in developing countries (e.g., Arora, 2019; Shiau et al. 2018). However, this subject has been less the focus of much less research in South Africa according to Chireka and Fakoya (2017). From a theoretical point of view, cash holdings decisions

depend on three main theorems that are linked to characteristics of firms and more specifically, their internal and external financing sources: the trade-off theory (Myers, 1977; Opler et al. 1999), the pecking order theory (Myers and Majluf, 1984) and the free-cash flow theory (Jensen, 1986). Moreover, and to a larger extent, four motives also explain why firms need to hold cash (Chireka and Fakoya, 2017; Kim et al. 2011). According to Shiau et al. (2018) and Chireka and Fakoya (2017), the precautionary motive, defined as the willingness of companies to increase the amount of cash holdings to face market instability, dominates surrounding a crisis period. Hence, significantly reducing investments to save cash is an effective approach when firms face a cash shortage due to a crisis (Shiau et al., 2018; Opler et al., 1999). Furthermore, a cash shortage may force companies to stop paying dividends, at shareholders' expense, and to use their cash flow to pay costs instead off investing (Naumoski, 2018). However, these measures can be dreadful for firms' competitiveness and business values in the recovery period (Joseph et al. 2020; Opler et al. 1999; Shiau et al. 2018). In South Africa, firms generally hold a significant amount of cash for several reasons, such as political instability or a lower rate of interest for credits (Chireka and Fakoya, 2017). Arora (2019) also supports these arguments and establishes that developing economies evolve in different and more volatile macroeconomic environments compared to advanced economies. Accordingly, internal financing sources are crucial for firms in developing economies in terms of competitiveness and resilience (Love and Zicchino, 2006).

In the empirical part, we firstly study the effect of the financial turmoil on cash holdings in 13 mining firms and 10 retail firms. We make use of panel OLS with fixed and random effect models. These models are widely used by scholars to study corporate cash holdings (e.g., Chireka and Fakoya, 2017; Shiau et al. 2018; Opler et al. 1999). Our analysis covers the period between 2001 and 2016. Secondly, we follow the framework of Shiau et al. (2018) to depict investment sensitivity to cash and cash flow after the crisis and surrounding the financial turmoil. Finally, we study investment response to a shock on a major internal financing source, i.e., cash flow (Love and Zicchino, 2006). For this purpose, we follow the framework of Love and Zicchino (2006) and we make use of a VAR model with one lag, an orthogonalized impulse response function, and the variance decomposition. Our thesis supports the importance of having sufficient cash and cash flow to maintain steady activities, and to preserve firms' competitiveness surrounding a financial crisis.

Part I: Macroeconomic impact of the financial crisis on South Africa

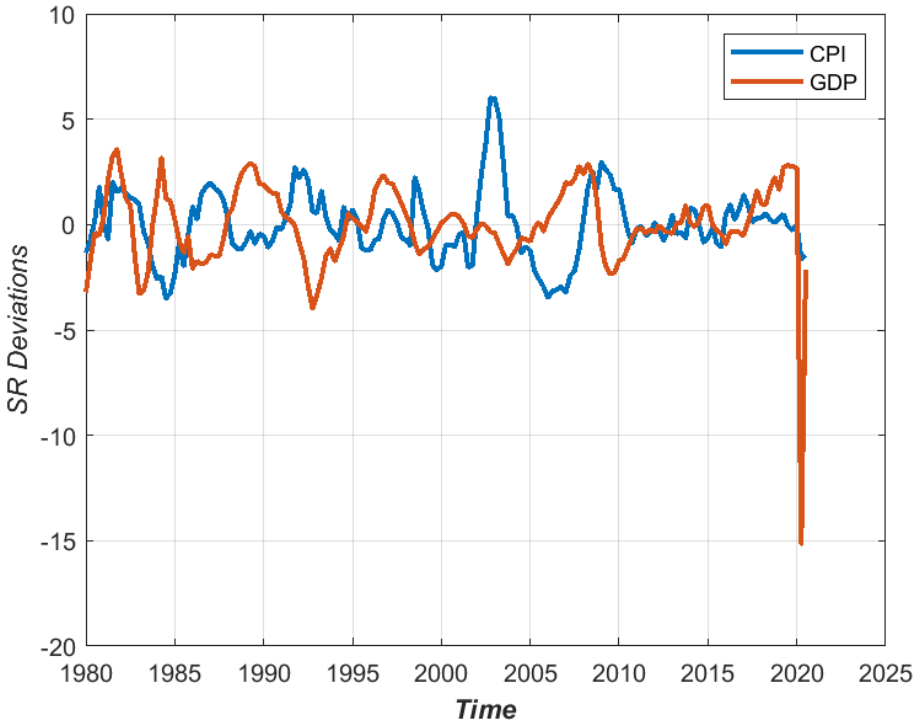
This part studies macroeconomic effects of the financial crisis on South Africa. We discuss the transmission shock mechanisms. Thereafter, we analyse the policy response from the Central Bank of South Africa and the national government.

1.1 The impact of the financial crisis on South Africa

The 2007-2009 financial crisis that originated from the United States has negatively affected developed as well as developing countries (Joseph et al. 2020; Laeven and Valencia, 2012; Moroke et al. 2014; Naudé, 2009; Ncube et al. 2016; Shiau et al. 2018). Since 2007, the economic growth of South Africa has become weak and economic activities in the country are irregular (Ncube et al. 2016, p. 5 and p. 28).

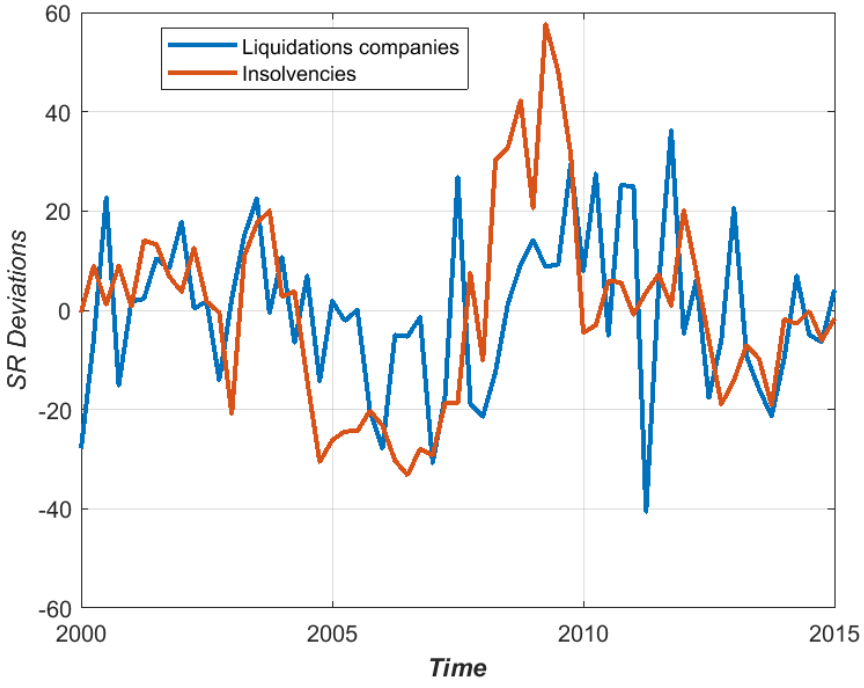
Figure 1 identifies the negative shock for the real GDP of South Africa during the crisis and reports a decline of the economic activities (Ncube et al. 2016, p. 1; Moroke et al. 2014, Verick, 2012). Furthermore, this figure highlights a drop of the inflation during the same period and therefore reveals that the demand shock dominates the economy. Leduc and Liu (2016) use the Bayesian vector-autoregression (BVAR) to highlight that the drop of the inflation and employment is explained by uncertainty shocks. In other words, uncertainty and expectations of a lower output and price level push up the unemployment rate and reduce incomes, which therefore push down the prices (Houssa et al. 2019). In South Africa, Verick (2012) estimates that almost one million jobs were lost in 2009. Therefore, the decline of output and inflation increase poverty and also negatively affects investment (Ellyne and Veller, 2011; Moroke et al. 2014; Phiri, 2017; Steytler and Powell, 2010). The reduction of investments is explained by the global uncertainty on the financial markets. In other words, industries are negatively affected due to the lack of access to financial funds and decisions in terms of investments for managers are difficult to be taken. Furthermore, companies become exposed to insolvency risks. The financial crisis of 2007-2009 is responsible for the bankruptcy of companies and industries (Freedman and Laxton, 2009; Moroke et al. 2014; Kahle and Stulz, 2013; Shiau et al. 2018; Veller and Ellyne, 2011). In South Africa, figure 2 highlights a peak of insolvencies and companies' liquidations during the financial turmoil.

Figure 1: cyclical components, Real GDP and CPI, South Africa.



Data source: South Africa Statistics.

Figure 2: cyclical components, insolvencies and liquidations.



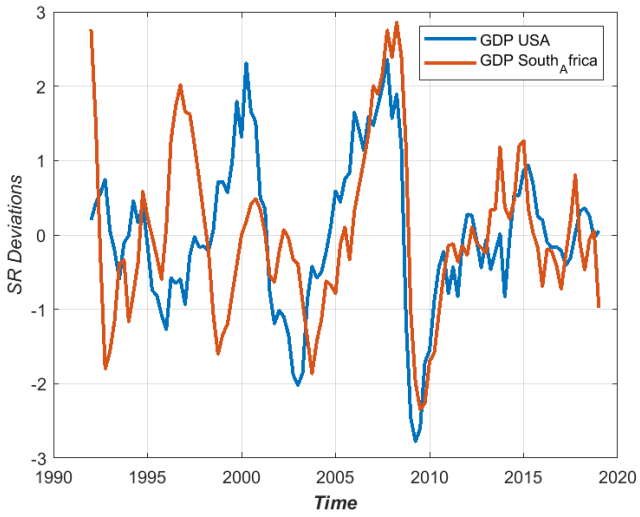
Data source: South African Statistics (Stat SA)

In the next section, we develop the two main transmission channels to pin down the mechanisms by which the demand shock dominates the South African economy during the crisis.

1.2 Transmission channels of the crisis

During the 2000s, South African government applied consistent policies to liberalize trade and financial activities. Consequently, the openness to trade and finance in South Africa is particularly high compared to other African countries (Houssa et al. 2019, Ncube et al. (2016, p. 15 and 51). Although Steinbach et al. (2009) report that foreign shocks do not influence macroeconomic fluctuations on South Africa's real GDP, figure 3 shows a significant correlation between the real GDP of the United States and South Africa during the financial crisis. By making use of a structural vector autoregressive (SVAR) and variance decomposition, Houssa et al. (2013) demonstrate that economic shocks (demand, supply, commodity price) from G7 countries account for more than 30% of macroeconomic fluctuations in South Africa. Ncube et al. (2016, p. 7) also highlight the importance of financial and trade interdependences between G7 economies and South Africa, especially during the subprime crisis. Moreover, Houssa et al. (2019) show a positive co-movement between real economic activities between the United States and South Africa. Accordingly, it is empirically demonstrated that the financial crisis shock was transmitted via trade and financial channels.

Figure 3: cyclical components of GDP in South Africa and the US.



Data sources: South Africa statistics and U.S. Bureau of Economic Analysis (BEA)

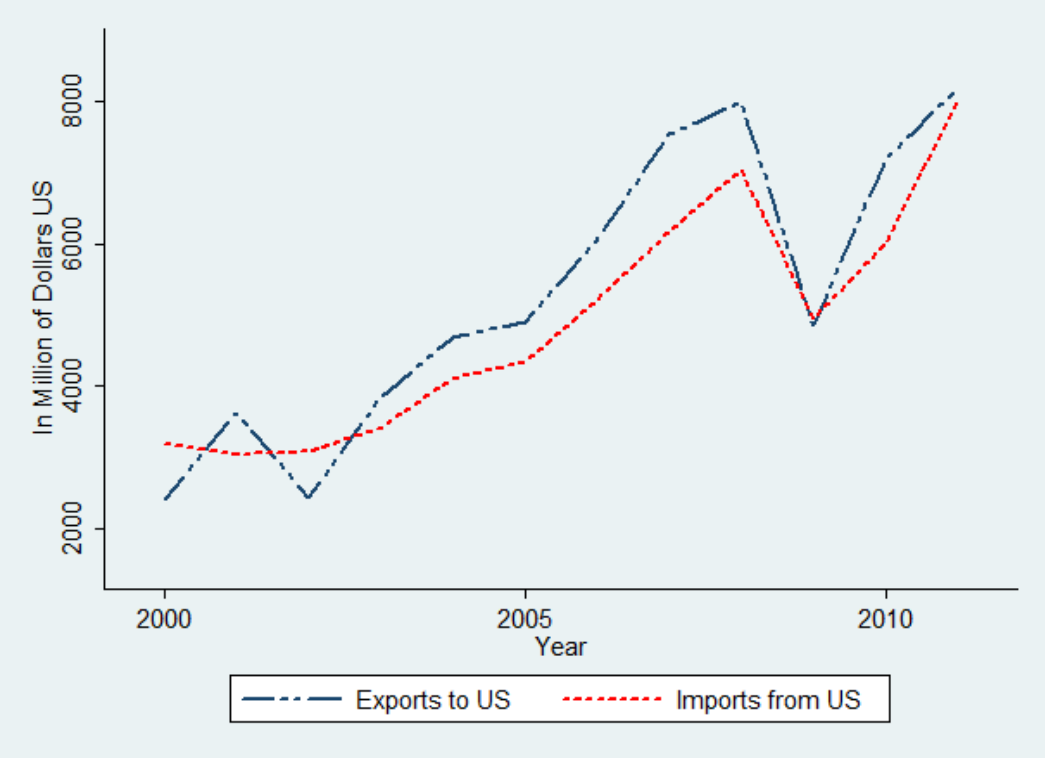
1.2.1 Trade channels

Trade channels are related to the trade dependency between developed and developing countries (Ncube et al. 2016, p. 6 and 54). In our case, the United States is a key partner for South Africa in terms of exports. Between 2005 and 2012, we find that exports from South Africa to the US represents on average, 8.3 % of the total exportations, i.e., 88 billion of dollars[1]. Therefore, an economic shock affects directly bilateral trade through the exchange rate.

Houssa et al. (2019) highlight that exports, interest rates, and GDP of South Africa are significantly affected by a shock on the US aggregate demand. Furthermore, they also highlight that the US stimulates its economic activities and prices through a positive aggregate demand shock. Therefore, exports in South Africa increase as a reaction of this positive shock and the prices in the country are stimulated. However, such a system makes South Africa vulnerable in terms of trade. According to the Mundell-Fleming Dornbush model, a monetary stimulus in a powerful economy, such as the United States, positively affects expenditures and its trade-balance. Hence, if exports are elastic, trade balance of the US improves. However, the South African exchange rate increases and deteriorate its exportations. In other words, policy shocks in the US significantly affect the exchange rate of South Africa, and consequently, its trade balance (Griffith-Jones and Ocampo, 2009; Naudé, 2009; Ncube et al. 2016, p. 6, p.54; Ndu et al. 2017). Houssa et al. (2019) support this intuition. By making use of an Impulse response function, they find that the decline of the policy rate in the US depressed exportations through the exchange rate appreciation in South Africa. According to Ncube et al. (2016, p. 54), exports and imports to the United States decrease significantly during the subprime crisis, which highlights the importance of international trade for transmitting shocks to South Africa. Figure 4 highlights the importance of the United States for South Africa in terms of trade.

[1] Data source: South Africa (ZAF) Exports, Imports, and Trade Partners | OEC - The Observatory of Economic Complexity, we computed the average between 2005 and 2017.

Figure 4: exports imports between South Africa and USA



Source: author, graphs based on data in table1

South African economy also depends on European countries, especially in terms of exportations. Accordingly, the crisis in Europe induced a drop of the European GDP and thus, affected the demand for South African exports negatively (Ncube et al. 2016, p. 6). The following table confirms that South Africa's economy is significantly dependent on G7 economies and also China (G7 consists of France, Italy, Canada, Japan, UK, US, Germany (Ncubé et al. 2016, p. 55)). The growth dynamics affected the exchange rate. It therefore implies that the decline in G7 economies during the subprime crisis led the economic recession in South Africa through exports, due to the exchange rate appreciation. Accordingly, South Africa became less competitive than other countries (Ncube et al. 2016, p. 6 and p. 7). Figures 4 & 5 confirm that imports and exports in South Africa decline significantly during the financial crisis.

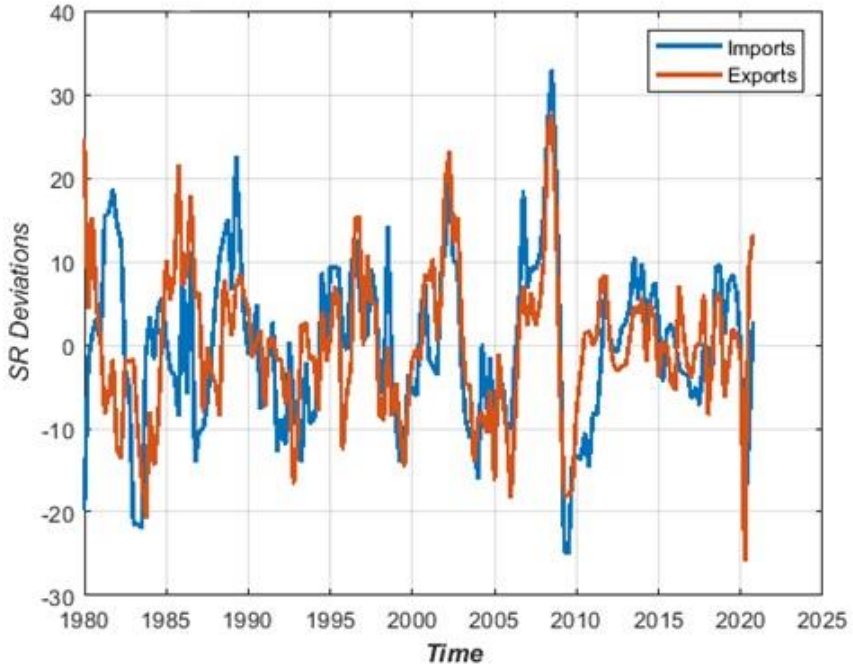
Table1: exports from South Africa to main economic partners

Dollars US, Millions, Exports, goods

Year	France	Italy	Canada	Japan	UK	US	Germany	China	World
2000	564	838	219	1355	2287	2409	1900	335	26297
2001	608	788	183	2306	2837	3631	2357	461	25997
2002	664	743	169	1490	2519	2439	1883	450	23064
2003	743	913	211	3148	3197	3844	2439	889	31635
2004	893	1190	360	4110	4215	4689	3236	1055	40263
2005	1068	1160	352	5280	5000	4893	3329	1368	46991
2006	1262	1347	440	6740	4627	6058	3944	2108	52601
2007	1383	1429	779	7650	5670	7528	5106	4169	64026
2008	1447	1595	425	7640	4906	7987	5748	4309	73965
2009	841	1080	354	4740	3000	4859	3512	5670	53863
2010	977	1418	535	7260	3676	7184	5496	8095	82630
2011	968	1750	478	5930	3936	8173	5470	12496	107956
2012	903	1350	438	5950	3345	7823	4048	10320	98824
2013	1007	1087	313	5950	3301	6909	3822	12047	95062
2014	909	1061	657	5130	3472	6483	4260	8772	92590

Data source: *Download trade data | UN Comtrade: International Trade Statistics*

Figure 5: cyclical components, Import and Exports



Data source: Africa Revenue Service (SARS)

The appreciation of the exchange rate is not the only explanation of the decline of South Africa exports. In countries where financial markets are developed, exports firms are also sensitive to a financial shock because of the default risk and the working capital needed. Exporters barely have working capital and therefore need to borrow (Amiti and Weinstein, 2011). Hence, exports firms that are dependent on financial markets and banks are significantly and negatively affected during a crisis (Amiti and Weinstein, 2011; Iacovone et al. 2019).

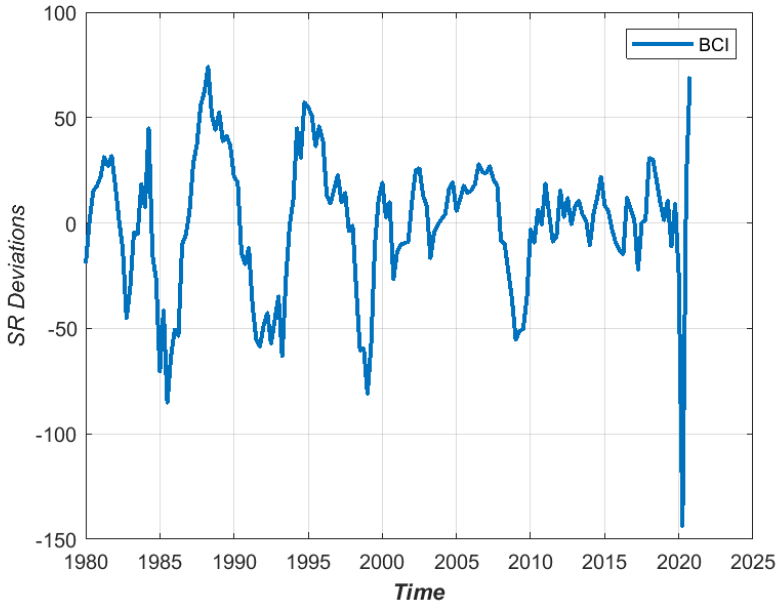
1.2.2 Financial channels

The deep liberalization of financial markets in South Africa induced an increase of European and American portfolio investments before the crisis. However, the country became vulnerable to a negative financial shock in the United States and European countries (Ncube et al. 2016, p. 68). Indeed, the subprime crisis induced a significant decline in foreign investments in South Africa (Madubeko, 2010). Furthermore, when the FED applied a reduction of the interest rate to encourage companies to invest and to support the consumption of households before the crisis (Kabundi and Rapapali, 2019; Moroke et al. 2014), it generated an inventiveness for economic actors to borrow money. Consequently, it created a bubbly. South Africa also applied low interest rates before the crisis to encourage people to invest and it generated a significant household debt in the country. Consequently, the risk of unsecured loans became a major concern in the country (Aron and Muellbauer 2000; Moroke et al. 2014).

When the financial crisis occurred and investments declined, it generated a freezing of financial markets, a drop of assets value, and a loss of confidence in the financial markets (figure 6 highlights a negative shock on the business confidence during the crisis). Therefore, Investors were forced to extract their capital from financial markets in South Africa (Madubeko, 2010; Moroke et al. 2014, SARB, 2009). Consequently, it significantly reduced the possibility for firms to raise funds through equity and invest in their activities (Moroké et al. 2014). Furthermore, commodity prices and financial sectors interact in South Africa through the value of collateral. In other words, when the price of commodities declines, the value of collateral is reduced and hence, credits conditions become tight. Therefore, investments and consumption are reduced (Houssa et al. 2019). Moreover, banking activities in South Africa plays a major role and are relatively well developed. The banking sector is dominated by four main banks and the rest are a very small proportion of the market. In other

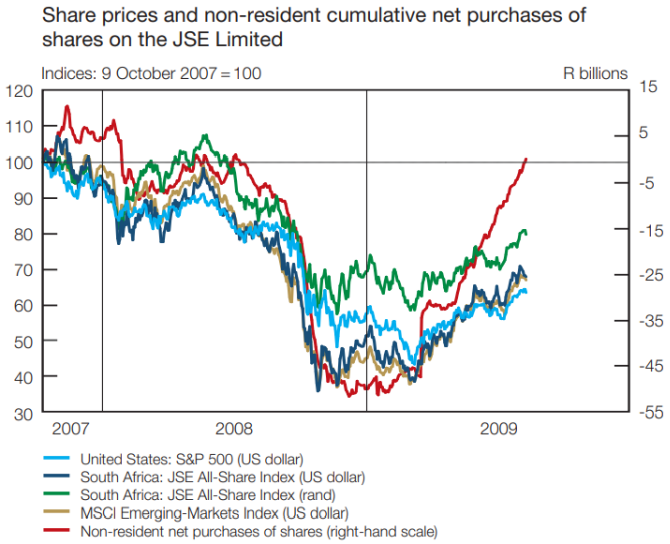
words, the level of banking concentration is high in the country and threats the capacity for firms to borrow (Maredza and Ikhide, 2013). Moreover, a negative aggregate demand shock in a country supports the decrease of consumption and firms credit (Brunnermeier and Oehmke, 2013; Kahle and Stulz, 2013). In addition, Brunnermeier (2009) Shleifer and Vishny (2010) and Kahle and Stulz (2013) show that, due to the lending supply shock theory, banks decline their supply of loans to companies during a financial crisis. Therefore, bank dependent firms reduce their capital expenditures to save liabilities. In South Africa, Karwoski (2018) highlights that credit conditions were tightened. Indeed, the SARB (2009)'s report highlights a significant drop of loans to firms and households during the crisis. In conclusion, the global uncertainty significantly increased the incapacity to raise funds (by credits or shares) for many South African companies (Madubeko, 2010; Nyamgero, 2015). Figures 7 & 8 support these findings.

Figure 6: cyclical component, business confidence interval



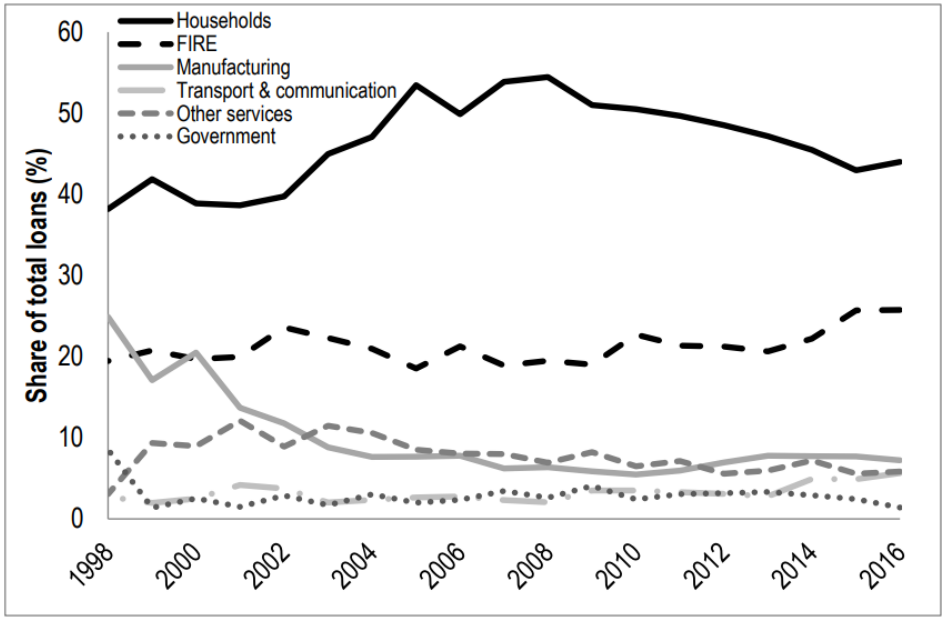
Data source: Bureau for Economics Research of South Africa (BER)

Figure 7: purchase shares



Source: SARB (2009, p. 75).

Figure 8: Four Major Banks of South Africa, lends



Source: *Karwoski (2018) p.25*

1.3 Policy responses

According to Akyüz (2009), an economic crisis necessarily implies an immediate policy response to stabilize the economy. For instance, some developing countries facilitated the credit conditions during the crisis to support consumption or investment and reformed their financial systems (Akyüz, 2009). In this section, we examine the monetary and fiscal policy responses to the financial crisis.

1.3.1 Monetary policy response

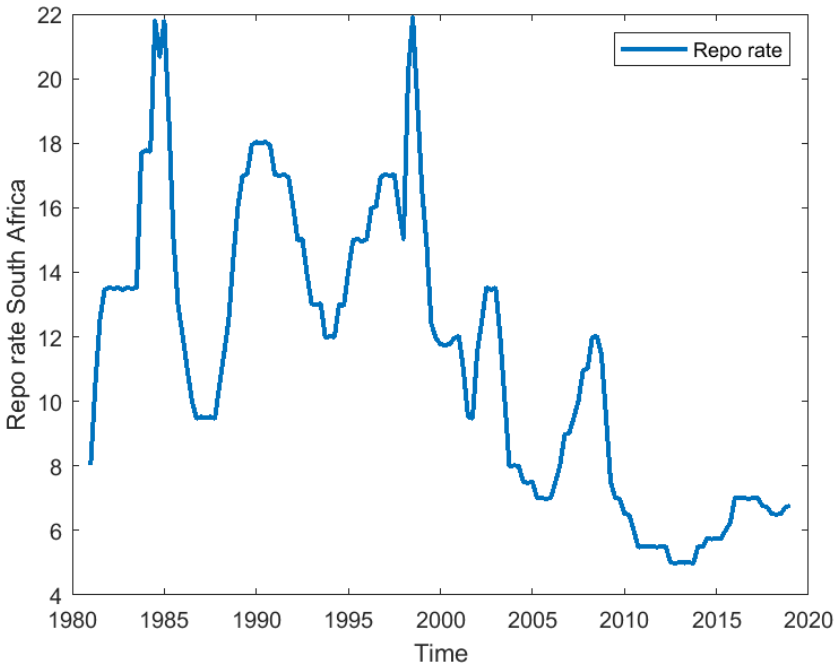
SARB applied a targeting monetary regime (Phiri, 2017) or the Taylor's rule (1993), where short-term interest rate is a function of predetermined variables (Ellyne and Veller, 2011). (Naraidoo and Raputsoane, 2015; Svensson, 2000). The policy is defined as the following: *"(…), inflation targeting involves taking the inflation rate as the nominal anchor and creating a policy response 'function' to manage it"* (Ellyne and Veller, 2011, p. 2) or "*the central bank changes its policy rate in response to a divergence of output from its potential level (output gap) and the projected inflation (or inflation expectations) from its desired rate*" (Klein, 2012, p. 4). In other words, the monetary policy applied by the Central Bank of South Africa in response to the financial crisis aims to stabilize the price and output, where price stability is the main objective. Further, it implies multiple components (Ellyne and Veller, 2011; Bernanke and Mishkin, 1997; Miao, 2009), such as:

- Inflation target identification: low and stable inflation is the objective of the Central Bank.
- Transparency framework: transparent communication from the authority to the public.
- Accountability framework: Central Bank is responsible to achieve its objectives and answer to the government if there is a failure.
- Appropriate institutional arrangements: Central Bank should be independent and sufficient financial markets development is required.
- Policy rule: choice of targets or tools use by the Central Bank.

The inflation targeting can be flexible or strict. In the case of South Africa, the SARB applies strict targeting of inflation, which implies a primary concern for inflation stability and a secondary concern for GDP growth and exchange rate according to Ellyne and Veller (2011) and Houssa et al. (2019). In particular, the success of inflation targeting policy depends on the initial macroeconomic shock, i.e., a supply shock or a demand shock. A demand (supply) shock induces a positive (negative) correlation between the output and inflation. In the case of a negative demand shock, the right policy is to decrease the interest rate, which increases inflation and output until both reach back the initial equilibrium (Blanchard and Gali, 2007; Ellyne and Veller, 2011). For the supply shock, a policy response could be to increase interest rate to reduce the inflation and stabilize the economy (Ellyne and Veller, 2011; Stiglitz, 2008).

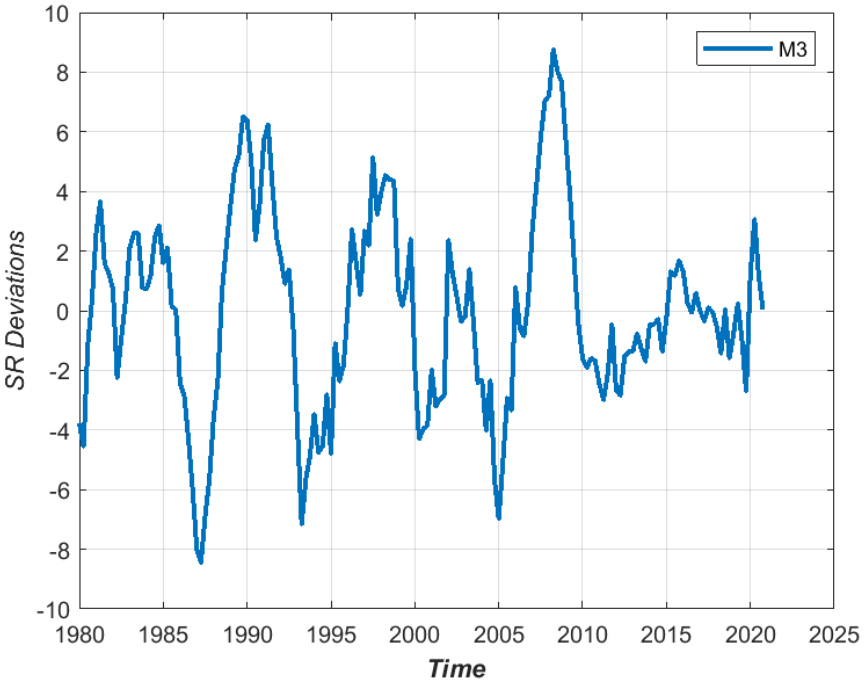
The official policy rate of the Central Bank is the repo rate. When the CB changes it, banking's interest rate and borrowing possibilities are directly affected. In other words, an increase of this repo rate reduces the possibility for banks to borrow and thus, they must increase their commercial interest rates. This policy allows to reduce the quantity of money in circulation and hence, inflation (Matemimola et al. 2015). According to Phiri (2017) and Klein (2012), the targeting of inflation by the SARB was a set from three to six per cent in 2005 and even after. If the inflation rate is upper than six per cent, the SARB will increase the policy rate. Hence, it contracts the economy (Phiri, 2017). According to figure 9, the repo rate applied by the South African Central Bank has increased between 2005 and 2007 and declined between 2008 and 2009. According to Moroke et al. (2014), this monetary policy between 2008 and 2009 aimed to encourage firms to continue to finance their activities through credit borrowing. However, Matemilola et al. (2015) show that the effectiveness of the monetary policy is threatened by the high concentration of South African banks. Indeed, when the SARB increases its repo rate, commercial banks are more rigid to increase their lending rate. Consequently, monetary policy rate applies by the SARB is not well followed by commercial banks, which increases the risk of asymmetric information in the loan market and uncertainty (Matemilola et al. 2015). Furthermore, the money supply and credits (M3, figure 10) were reduced by the SARB significantly between 2007 and 2009. This sharp decline reflects the global drop of financial assets value and the tightening of credit conditions for corporates (SARB, 2009 p.72). In conclusion, uncertainty seems to dominate the credibility of monetary policies during the global crisis.

Figure 9: repo rate in South Africa



Date source: SARB (Reserve Bank of South Africa)

Figure 10: cyclical component, M3.



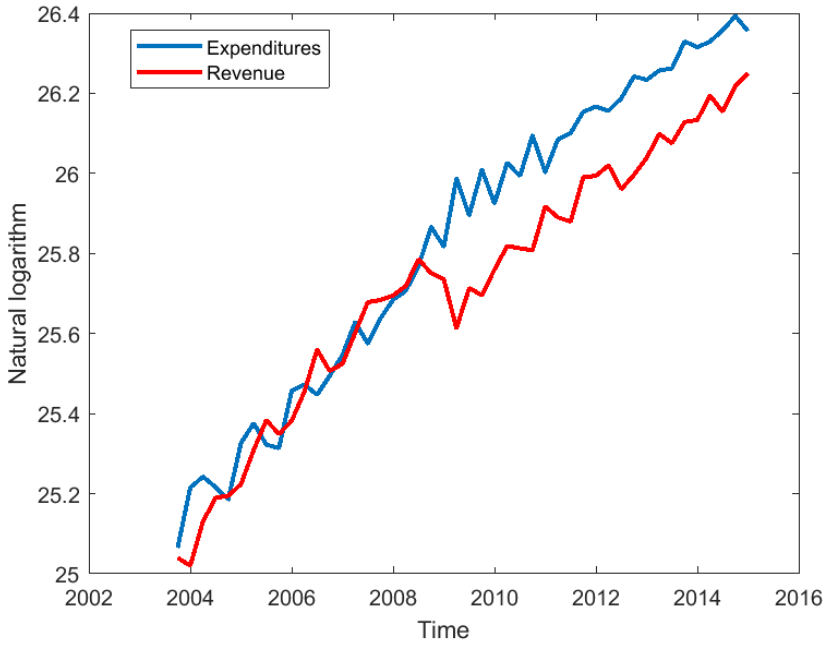
Data source: Reserve Bank of South Africa

1.3.2 National government's policy response

Before explaining the national policy response, we introduce the structure of the South African government. ***Firstly***, economic aspects and fiscal policy are under the control of the national government. It therefore implies that the national government is responsible for the major tax instruments, such as value-added taxes. ***Secondly***, the national government provides the directives to the South African Central Bank, to control the currency and the monetary aspect. ***Thirdly***, the provincial and local authority power depends on the national government. The aim of the provincial and local is to support locally the national government, by providing the social services (Steytler and Powell, 2010).

The financial crisis induced a rapid contraction of the national government revenue and an expansion of social services demand. During the crisis, public expenditure as a percentage of GDP was above the government revenue and social assistance was needed to overcome the increase of poverty and unemployment (Steytler and Powell, 2010). According to the SARB (2009), interests on the national government debt increased by 2.8 per cent. Therefore, a budget re-prioritization was needed. However, the financial crisis induced a social and political fallout, including macro-economic and political instability (Steytler and Powell, 2010).

Figure 11: government expenditures and revenue, in log.



Data Source: South African National Treasury

The government's national response was in the first time, to answer at the economic recession. The budget was therefore established to protect the more vulnerable people (i.e., the poor's) and to maintain steady fiscal stability. Therefore, social expenditures were included in the government's response (Steytler and Powell, 2010). Despite the financial crisis, taxes were collected on income, profits, and capital gains in order to increase government revenues between 2008 and 2009 and government issued bonds to gather funds. However, the borrowing requirement increased significantly in the non-financial corporates between 2007 and 2009 (from 0.9 to 87.4 billion of Rands). Financial resources were needed to support this economic sector. Moreover, the deficit of non-financial sector companies was estimated around 90 billion of Rounds over the medium term (SARB, 2009).

Despite the global uncertainty which enforced the financial turmoil, South Africa's government applied counter-cyclical policy to support economic development in the medium term. Hence, they applied public investment program. Economy became the highest priority. The purpose was to emerge from this crisis more competitive and credible. Therefore, South Africa's government had as a main objective, job creation and poverty reduction (SARB, 2009).

Conclusion of part I

In this first part, we have seen that the financial crisis of 2007-2009 affected developed and developing countries (Ncube et al. 2016). In South Africa, the country experienced an economic recession, with an increase of poverty and unemployment (Moroke et al. 2014).

This crisis was transmitted to South Africa through two main channels (Naudé, 2009; Ncube et al. 2016): trade channels and capital flow channels. The first one is related to the international trade, more specifically about exports, imports, exchange rate and trade dependency between countries. In this case, South Africa is highly dependent on the United States and European countries, which increases the risk of transmission shock (Ncube et al 2016). The second one covers the financial markets. In 2000, the government supports the liberalization of markets in South Africa and consequently, investments from the United States and Europe increased significantly (Ncube et al. 2016, p. 68). However, the monetary policy applied by the United States before the global crisis was followed by South Africa and consequently, consumption and investments increased through credits. Accordingly, household debt became significant in South Africa (Aron and Muellbauer, 2000; Moroke et al. 2014). When the financial crisis occurred, credits conditions became tight, and bank dependent firms reduce their investments to face this constraint. In other words, the global uncertainty generated by the crisis prevented firms and households to borrow (Madubeko, 2010; Nyamgero, 2015).

After discussing the effect of the crisis and the transmission channels, we discussed about the monetary and national government policies implemented during the crisis. In terms of monetary policy, the South African Central Bank applied a targeting inflation regime. This means that, where a negative demand shock occurs, the good policy is to decrease the repo rate to allow the economy to go back to its equilibrium through consumption and investments (Blanchard and Gali, 2007; Ellyne and Veller, 2011). However, the monetary policy of the South African Central Bank is threatened by the significant concentration of commercial banks. Consequently, when the Central Bank decreases its policy rate, commercial banks do not follow this policy and let their commercial rate unchanged. Hence, uncertainty dominates the financial market and the credibility of the Central Bank (Matemilola et al. 2015). In terms of government policies, a counter-cyclical policy was applied during the recession to support economic actors (SARB, 2009). However, the global crisis significantly affected the government and created a social and political fallout (Steytler and powell, 2010).

Part II: Corporate cash holdings and investment surrounding the crisis

Many studies examine why cash holding matters (e.g., Arora, 2019; Bates et al. 2009; Bigelli and Sanchez-Vidal, 2010; Chang and Noorbakhsh, 2009; Ferreira and Vilela, 2004; Le et al. 2018; Naumoski, 2018; Opler et al. 1999; Ozkan and Ozkan, 2004; Pinkowitz and Williamson, 2001; Shiau et al. 2018). According to Le et al. (2018), cash is a vital asset for firms because it allows maintaining steady economic activities. Otherwise, it will be necessary to raise capital through expensive sources, such as financial markets and bank credit markets. However, cash holding is affected by economic conditions or firms' characteristics (Shiau et al. 2018). Accordingly, the level of cash is not the same between companies in developing and advanced economies (Arora, 2019; Naumoski, 2018). For instance, Chireka and Fakoya (2017) and Chireka (2020) affirm that South African firms tend to hold a high level of cash due to economic instability, while companies in advanced economies invest more and hold less cash (Naumoski, 2018). Firms in developing economies face greater asymmetric information, a lack of regulations, and more macroeconomic volatility. Hence, getting access to external financing sources is more expensive for them. It suggests that firms in developing economies are more dependent on internal funds due to market imperfections (Arora, 2019).

As we previously saw, the financial turmoil generates external financing constraints for capital demanders. Furthermore, agency problems and asymmetry information persist between capital demanders and suppliers (Shiau et al. 2018). Therefore, the aim of the following section is to highlight theoretical explanations and empirical evidences of why companies hold cash and why they need to do so, especially surrounding a financial turmoil period.

2.1 Cash holdings and investment surrounding a financial crisis, empirical evidences

In a perfect world, holdings cash is a not relevant. Indeed, firms can raise funds and invest without cost. Even for large corporates, the wealth of shareholders is unchanged when a firm borrows and invests. In a real world, it could be expensive for firms to run out liquid assets and hence, cash holdings decisions depend on companies' characteristics and stakes (Shiau et al. 2018).

The firm's objective is to equalize the marginal benefit of holdings assets to the marginal cost of holdings assets to avoid financial distress. This first fundamental reason is defined as the

trade-off theory (Opler et al. 1999). Theoretically, small corporates are riskier and tend to hold more cash because external financing costs are expensive compared to larger firms. Therefore, the size of the company and the demand for cash have a negative correlation (Kim et al. 1998). Kim et al. (1998) in the US, Le et al. (2018) in the UK, and Chireka (2020) in South Africa empirically support this state. Scholars highlight this result through an OLS model with fixed and random effects and they use as a proxy variable the logarithm of asset to study the firm's size. This empirical approach is extremely common in the literature to examine cash holdings decisions (see for instance Chireka and Fakoya, 2017; Naumoski, 2018; Opler et al. 1999; Kim et al. 1998; Shiau et al. 2018). Moreover, the trade-off theory shows a positive correlation between cash and dividends payment. In other words, firms tend to hold cash to be able to pay dividends (Naumoski, 2018). In South Africa, Chireka and Fakoya (2017) highlight a positive and significant correlation between cash and dividends payable for firms in the retail sector.

In larger corporates, managers should take investment decisions such as it maximizes shareholders' wealth. However, they could have discretionary power due to asymmetric information, at shareholders' expense. In that case, managers could enforce their managerial power and maximize their own satisfaction. Consequently, cash level of the firm will be very high, and managers do not invest in profitable projects, which generate a significant loss for shareholders. This scenario is well known in large firms and is called the free cash flow theory (Le et al. 2018, Ozkan and Ozkan, 2004). Chireka and Fakoya (2017) and Opler et al. (1999) affirm that companies with a high level of liquid asset substitutes and cash holdings could be a signal of agencies problems. Furthermore, liquid assets substitutes can be easily converted into cash and investments at a very low cost. In that case, the correlation between cash and liquidity is negative. However, firms which maintain a high amount of liquid assets substitutes and cash invest less in profitable activities. Ozkan and Ozkan (2004) use the market-to-book ratio[2] as proxy variable to measure whether managerial ownership affect the presence of investment opportunity in UK corporates. However, their results were not significant. By using the percentage of equity holds by directors, they tested whether the board composition affect growth opportunities at a low level of ownership. Their results were also not significant. However, for a high level of directors' ownership, results are significant. Moreover, Kasongo (2019) highlights that if firms hold cash with a high level of leverage,

[2] Total assets minus the book value of equity plus the market value of equity to book value of assets.

investor could suspect agency costs. Unlike the free-cash flow theory, the trade-off theory reports a negative correlation between cash and liquid assets because liquid assets can easily be converted into cash and hence, holding a significant amount of cash is useless for the company in this case (Chireka and Fakoya, 2017; Ozkan and Ozkan, 2004). According to Chireka and Fakoya (2017), this positive correlation is strongly supported in the literature. Further, they found a significant and negative relationship between cash and liquid assets.

Surrounding a crisis, several reasons could explain why cash holdings affect firms positively. For instance, cash is an internal source of funds where credit conditions are tightened due to the financial turmoil (Joseph et al. 2020). In other words, holding cash allow firms to maintain steady operations because they can save external financing costs. This reason is called the transactional motive (Shiau et al. 2018). Furthermore, the pecking order theory also supports this motive (Myers and Majlul, 1984). Indeed, due to a financial crisis, asymmetric information between financial institutions and corporates increases due to uncertainty. Therefore, raising funds or borrowing costs become expensive. In that case, firms use internal funds to save external financing costs (Ferreira and Vilela, 2004; Ozkan and Ozkan, 2004). Moreover, Myers and Majluf (1984) argue that asymmetric information is more important for companies that are valued by growth options. If such firms face a cash shortage when they have a profitable investment opportunity, their values may decrease significantly. Hence, they tend to hold cash to be able to invest in profitable activities. Empirically, Opler et al. (1999) use as a proxy variable the natural logarithm of the book value of assets to test this statement. Nevertheless, their results were not significant. From the perspective of cost of capital and the uncertainty of financial markets, the pecking order theory establishes the demand of firm financing, with equity financing, debt financing and retained earnings (Shiau et al. 2018). Empirically, firms may reduce their capital expenditures and / or dividends to raise more cash, especially when they face a shortage of capital financing. Reduce investments is considered as the most effective approach to save cash (Opler et al. 1999; Shiau et al. 2018). In that case, the correlation between cash, dividends, and investment is negative (Naumoski, 2018; Opler et al. 1999). In his paper, Naumoski (2018) uses capital expenditures as a proxy variable of investment and highlights a negative correlation with cash in South-East European firms. Following this theory, we provide the following hypothesis:

Hypothesis 1: Dividends and cash holdings have a negative correlation.

Hypothesis 2: Investment and cash have a negative correlation.

Moreover, and unlike the trade-off theory, the pecking order theory establishes a positive relationship between cash and the firm's size. According to this theory, larger firms hold cash to control and finance their future expansion, even during a crisis, and hence, avoid using external financing resources (Chireka and Fakoya, 2017; Naumoski, 2018; Opler et al. 1999). Empirically, Chireka and Fakoya (2017) support this. Nevertheless, studies on the corporate life cycle's show that companies need to take cash holding decisions according to the stage of their developments. These decisions are extremely important for firm's performance and growth. However, South African firms seem to ignore this theory and conserve a high level of cash at each step of their development, which is detrimental for their future competitiveness (Chireka, 2020). In our case, we expect a positive correlation between firms' size and cash.

Hypothesis 3: Firm's size and cash have a positive correlation.

Corporates may be pessimist and could anticipate future adverse economic shock by holding cash. In other words, firms hold cash as a safeguard. This reason is called the precautionary motive (Shiau et al. 2018). According to this motive, holding cash during a period of a crisis helps companies, and especially those who are financial constrained, to resist the financial turmoil (Joseph et al. 2020; Le et al. 2018, Shiau et al. 2018). In other words, firms with cash are protected against assets prices decline and can use it as collateral (Joseph et al. 2020). Moreover, and unlike the trade-off theory, the precautionary motive reports that a high leverage makes sense because firms hold liabilities to avoid bankruptcies (Chireka and Fakoya, 2017; Kim et al. 2011). In South Africa, Chireka and Fakoya (2017) highlight a positive correlation between leverage and cash. Nevertheless, the result is not significant. They also argue that South African companies hold more cash on average than firms in developed economies for precautionary motives. Following this theory, we expect a positive correlation between cash and leverage.

Hypothesis 4: cash and leverage have a positive correlation.

Karlowski (2018) also argue that many South African firms hold cash during a crisis for the same motives. Moreover, Kasongo (2019) finds that non-financial firms held a significant level of cash despite their growth between 2007-2017. Furthermore, he highlights that economic stability, investment opportunities and business confidence are inversely correlated to cash holdings. These outcomes suggest potential precautionary motive or agency costs in South African companies (Kasongo, 2019).

Firms may have a relevant magnitude of liquidity, or working capital, to meet random events, such as a financial crisis and drop of capital supply. However, a high level of liquidity is detrimental for corporate profitability and investments. Indeed, if the working capital is high, firms reduce their profitability and competitiveness. Therefore, an adequate management of liquidity and more specifically, cash flow, is crucial for firms during a financial turmoil (Shiau et al. 2018). There is a strong and positive correlation between cash flow, cash, and investments under the pecking order theory. Besides, cash flow is considered as a crucial internal financing resource for investments (Chireka and Fakoya, 2018; Love and Zicchino, 2006; Naumoski, 2018). Hence, a decline of cash and cash flow reduce firms' competitiveness through investments (Hovakimian and Hovakimian, 2009; Shiau et al. 2018). Arslan et al. (2006) highlight that financial constrained firms during the 2001-2002 crisis in Turkey have a high investments' cash flow sensitivity. Nevertheless, Machokoto et al. (2020) highlight a drop of cash flow sensitivity during the subprime crisis, including South African corporates. However, the trade-off theory shows that cash flow is a substitute of cash and firms can use it to pay debts when they face a cash shortage. Hence, the correlation is negative in that case, and it reports difficulties for firms to invest, and to preserve their competitiveness (Naumoski, 2018). Chireka and Fakoya (2017) do not find empirical evidence of this in South Africa. In our case, we expect a negative correlation between cash and cash flow surrounding the financial crisis.

Hypothesis 5: cash and cash flow have a negative correlation.

Most of empirical research on cash holding and investments decisions make use of OLS model. However, Joseph et al. (2020) employ the local projection (Jorda, 2005), which allows to analyse of firms' investment response to a financial shock. This framework, developed by Jorda (2005), allows determining estimation for each horizon. This technique is supposed to be more robust than an Impulse Response Function. Nevertheless, this argument remains questionable (Ronayne, 2011).

Joseph et al. (2020) demonstrate that companies with cash can continue to invest in advertising, development, or fixed assets, despite the financial turmoil and hence, they take a serious strategic and competitive advantage in the long run. In contrast, poor cash companies are obliged to liquidate fixed assets to survive and are not able to invest. Hence, the value of fixed assets highlights an investment gap between rich and poor cash firms. When the demand increases and credit conditions return in the recovery period, cash rich firms easily meet this demand and can continue to invest more. In other words, they become more and more

productive, while liquidity poor firms face difficulties to regain a decent level of productivity, especially if banks only borrow to low-risk firms. From this angle, firms who have a significant level of cash do not need to hold more cash for precautionary motives anymore and become more competitive (Almeida et al. 2004; Berg, 2018, Joseph et al. 2020). Furthermore, Joseph et al. (2020) show the importance of liquid balance sheet when credit supply declines, especially in terms of productivity and competitiveness in the long-run. Furthermore, Love and Zicchino (2006) use a vector autoregressive model with an orthogonalized impulse response function to show that investments respond to macroeconomic conditions, financial markets development, and internal financing resources. Firms' investments in developing countries highly depend on internal funds because corporates face difficulties to have access to the credit market due to uncertainty and inefficient capital allocation. Hence, findings of Joseph et al. (2020) are relevant when financial markets are well developed, and allocation of capital is efficient.

Conclusion of part II

In this part, we highlighted that cash is a vital asset for firms. However, cash holdings decisions are affected by firms' characteristics and macroeconomic conditions (Le et al. 2018; Shiau et al. 2018). Theoretically, cash holdings is explained by three main theories: the trade-off theory (Opler et al. 1999), the pecking order theory (Myers and Majlul, 1984), and the free-cash flow theory (Ozkan and Ozkan, 2004) and two main motives, the transactional motive, and the precautionary motive (Shiau et al. 2018).

During a crisis, the pecking order theory predicts a rise of asymmetric information due to the global uncertainty and hence, raising funds become complicated and expensive for firms. In this case, cash can be used instead external funds (Myers and Majlul, 1984). In other words, holding cash is a good reason for firms because they are protected against external financing costs. This motive is called the transactional motive (Shiau et al. 2018). The pecking order theory also predicts a drop of firms' investments and dividends payment to save cash, especially when they face a shortage of internal financing sources (Opler et al. 1999). Furthermore, this theory predicts a positive correlation between firm's size and cash, because larger firms will continue to retain cash at different stage of their development and to use it to finance their future growth. Hence, holding cash matters for competitiveness and resilience (Opler et al. 1999). Finally, this theory states a positive correlation between cash and cash flow and especially, the importance of liquidities and equities management surrounding a financial turmoil period (Shiau et al. 2018).

The trade-off theory shows that the aim of the firm is to equalize the marginal benefit of holding assets to the marginal cost (Opler et al. 1999). Furthermore, small corporates are riskier than larger firms and hence, they hold more cash because raising funds is particularly expensive for them, especially during a crisis. Accordingly, the trade-off theory predicts a negative correlation between firm's size and cash (Kim et al. 1998). Moreover, this theory shows a positive correlation between dividends and cash and a negative relationship between liquid assets and cash (Chireka and Fakoya, 2017; Ozkan and Ozkan, 2004). Finally, the trade-off theory establishes a negative correlation between cash flow and cash, because firms use cash flow to pay costs instead for investing, which is detrimental for their competitiveness (Chireka and Fakoya, 2017).

In large firms, the free-cash flow theory shows that managers could enforce their discretionary power at shareholders' expense. Therefore, managers do not invest in profitable projects and want to conserve a high amount of cash (Ozkan and Ozkan, 2004). Furthermore, if firms conserve a high amount of cash and liquid assets, scholars should suspect agencies problem (Chireka and Fakoya, 2017). This statement is important to keep in mind because firms in developed countries tend to hold more cash than corporates in advanced economies, due to uncertainty and macroeconomic economic factors (Naumoski, 2018).

Firms may anticipate the future and especially economic shock negatively. Hence, they tend to hold cash to face these potential negative shocks. This reason is known as the precautionary motive (Joseph et al. 2020; Shiau et al. 2018). Therefore, high leverage and cash are crucial to be resilient. In addition, cash can be used as a collateral if assets' value decline (Joseph et al. 2020). In their paper, Joseph et al. (2020) make use of a local projection (Jorda, 2005) and show that firms with cash before crisis can continue to invest. Hence, they take a significant competitive advantage. In other words, holding a significant amount of cash before a crisis may affect positively and significantly firms' competitiveness during the recovery period. Furthermore, Love and Zicchino (2016) make use of a panel VAR model and show that investments significantly respond to a shock on financial markets development, capital allocation, and especially cash flow in developing countries.

Part III Methodologies

Our objective is to study corporate cash holdings in South Africa surrounding the subprime crisis. Thereafter, we study investment sensitivity to internal financing resources. Finally, we examine how investments respond to a shock on a major internal financing resource. For these purposes, we put forward our samples and empirical models in this part.

3.1 Data

Our sample includes 23 South African firms from the non-financial sector. More specifically we use data on 13 firms operating in the mining sector and 10 in the retail sector. Data were collected on Iress database and are annually expressed. We exclude companies in the financial sector (banks, insurances) because they must hold cash for specific reasons, such as prudential controls (Naumoski, 2019). We also exclude firms with uncompleted data or observations. The data cover the period between 2001 and 2016.

3.2 Empirical models

Firstly, we follow the widely used framework to study cash holdings surrounding the recent crisis. In other words, we make use of a panel regression model to depict cash holdings and the importance of internal financial resources on investments. We make use of the Hausman test to determine whether a random or fixed effect should be considered. According to Mundalk (1978) and Baltagi et al. (2003), random effect model assumes that all regressors and individual effects are exogenous, while fixed effect reports the opposite. Our results are in favour of the random effect. Nevertheless, we provide fixed effect results, and we compare the outcomes. Moreover, we perform the regression before, during, after the crisis, and the overall period. We correct the OLS standard error by making them robust (Torres-Reyna, 2017). Our first equation is the following:

$$Cash_{i,t} = \propto_1 + \gamma_2 Size_{i,t} + \gamma_3 EBIT_{i,t} + \gamma_4 Cash\ Flow_{i,t} + \gamma_5 Investment_{i,t} + \gamma_6 Leverage_{i,t} + \gamma_7 Liquidity_{i,t} + \gamma_8 Dividends\_Dummy_{i,t} + \mu_{i,t} + \in_{i,t}$$

*** Dummy: 1 if firms pay dividends, 0 otherwise**.*

The following table describes our variables of interest.

Table 2: definition of selected variables

Variables	Description	Expected signs of regressors in the model	Literature
Cash	Cash available / total assets. It represents cash available.		Chireka (2020), Naumoski, (2018).
Size	Log of total assets.	Positive	Joseph et al. (2020)
EBIT	EBIT / total assets. It is an internal source of funds.	Positive	Shiau et al. (2018)
Cash Flow (Free cash-flow)	EBITDA / Total assets. It is considered as an internal resource of funds.	Negative	Chireka and Fakoya (2017), Love and Zicchino (2006) Naumoski (2018).
Investment	Capital employment / total assets. Represents the use of capital (brings by shareholders). The use of external funds.	Negative	Naumoski (2018) uses capital expenditures / total assets. We select capital employment to approximate investments' value.
Leverage	Total equity / asset. External financial resource to total assets.	Positive	We use this formula to approximate leverage.
Liquidity	Current assets / current liabilities. Current liabilities include short-term debts.	Negative	Danso and Adomako (2014), Sheikh and Wang (2011).
Dividends payable	Dividends payable	Negative	Kasongo (2019)

Source: author.

Furthermore, we depict the effect of internal financing resources on investments after the financial crisis. A poor level of cash and cash flow shows difficulties for firms to spend, especially after a financial turmoil, which is detrimental for their competitiveness (Shiau et al. 2018). To illustrate it, we follow the framework of Shiau et al. (2018). We capture the post crisis period with a dummy variable. A positive correlation between cash, cash flow, and investments reveals difficulties to invest. This correlation is supposed to be significant and positive, especially after the financial crisis. In contrast, a negative correlation reveals a good capacity to invest during the recovery period (Shiau et al. 2018).

$$Investment_{i,t} = \alpha_1 + \gamma_2 Cash\ Flow_{i,t} + \gamma_3 Cash\ Flow_{i,t} * Dummy_{i,t} + \gamma_4 Cash_{i,t} + ut$$

A dummy variable is added to capture the post financial crisis period.

Following the framework of Shiau et al. (2018), we thereafter exclude the dummy variable and regress for the different period (before, during, and after) surrounding the financial crisis to study investment sensitivity to cash flow and cash. Hence, our equation becomes the following:

$$Investment_{i,t} = \alpha_1 + \gamma_2 Cash\ Flow_{i,t} + \gamma_3 Cash_{i,t} + ut$$

Secondly, we depict the investments' response to a shock on an internal financing source. For this purpose, we follow the framework of Love and Zicchino (2006) and make use of a Vector Autoregressive Model. Moreover, we perform the Orthogonalized Impulse Response Function analysis. An OIRF analyses the response of a variable to a shock on other variables (Love and Zicchino, 2006; Ronayne, 2011).

Our VAR (1) model is the following:

$$\beta_{it} = \rho_0 + \rho_1 \beta_{it-1} + ut$$

Where ρ_0, ρ_1 are vector of constant parameters and coefficient respectively. β_{it} is a vector and includes two variables: cash flow (CF), capital employment to assets (KEA). We initially added turnover to equity (TRE) to depict the marginal productivity of equity (see Love and Zicchino, 2006 for more information) and cash (CH). However, these variables are not stationary. Hence, we drop them. Finally, it is the time horizon and equals eight in our case. Our first objective was to make use of a Panel VAR (Pvar) with an Impulse Response Function, following the framework of Abrigo and Love (2016). However, and despite our efforts, the Panel Var stability condition was not fulfilled. In other words, panel VAR is not

invertible and cannot provide a good estimation of an IRF (see Abrigo and Love (2016) for explanations).

We compute the average of cash flow and investments per year for each sector to apply our VAR (1) estimation and OIRF. To make variables stationary, we perform the difference per year for each indicator. We use the augmented Dickey-Fuller Test with one lag to confirm stationarity (see Cheung and Lai, 1995). Furthermore, we employ the Lagrange Multiplier test (Breusch and Pagan, 1980) to detect autocorrelation between variables. We cannot reject the null hypothesis, i.e., there is no autocorrelation in our VAR (1) model. We also test the normality via a Jarque and Bera (1980) test and errors are normally distributed. Moreover, we test the stability of our VAR (1) model. All the eigen values are in the circle and hence, our results can be interpreted robustly (Abrigo and Love, 2016).

We analyse capital employment to total assets (KEA) as a proxy variable of investments. Furthermore, cash flow (CF) is a major variable to show internal financing resources (Love and Zicchino, 2006; Shiau et al. 2018). By making use of an orthogonalized Impulse Response Function, we can depict investment response to a shock on cash flow (see Love and Zicchino, 2006). In other words, we can depict the effectiveness of having a high cash flow surrounding the crisis, and the relevance of internal funds in terms of resilience and competitiveness. We still consider the period between 2001 and 2016 in our analysis. We follow the assumptions of Love and Zicchino (2006) according to which investments require a delay to be done and respond to cash flow with one lag. Hence, if cash flow is shocked because of the crisis, investments should respond. On the other hand, cash flow should respond to a shock on investments with one lag. A VAR model considers all variables as endogenous (Dinh, 2020).

Finally, we present the forecast error variance decompositions (FEVD). Therefore, we can explain the percentage of variation of investments to a shock on cash flow (Love and Zicchino, 2006).

Part IV Empirical results

In this part, we report our results. We discuss about our outcomes for fixed and random effects in both sectors. Thereafter, we highlight our outcomes for investments' cash flow and cash sensitivity. Finally, we discuss about our VAR (1), orthogonalized Impulse Response Function, and variance decomposition outcomes.

4.1 Descriptive statistics.

Table 3 provides general outcomes about cash holdings and investments before, during, and after the financial crisis. We also consider the overall period. Since firms in developing countries tend to use internal financing resources because markets are less developed (Love and Zicchino, 2006; Naumoski, 2018), it is expected South African firms hold more cash than other companies in developed countries. As we can see, the mean of cash is 8% between 2007 and 2009 in the mining sector, while it declines and reaches 2% between 2010 and 2016. The level of cash seems to remain stable in the retail sector (around 13%) across time. However, this percentage is particularly high compared to the mining sector. Chireka and Fakoya (2017) also find the same outcomes in their studies (around 16%). Furthermore, these results highlight that South African firms hold more cash than corporates in other countries at the same period. Indeed, Chireka and Fakoya (2017) argue that Russian firms hold cash on average at 5%, 2% in India, or 3.5% in China. Moreover, Naumoski (2018) shows that, on average, firms in South-East European countries (i.e., Bulgaria, Greece, Serbia, Turkey…) hold 7% of cash between 2005 and 2015. However, Shiau et al. (2018) show that firms in China and Taiwan hold cash, on average, at 20% of their assets between 2007 and 2014. These results in the mining sector are consistent with theoretical motives according to which firms hold more cash during a crisis to maintain steady activities. Moreover, firms may protect themselves and their assets value against markets uncertainty (Myers and Majlul, 1984; Shiau et al. 2018). In other words, holding cash during a crisis allow companies to be resilient.

Investments slightly increase during the financial crisis in the mining sector, while it declines (65%) after the financial crisis. However, investment for retail firms continues to slightly increase even after 2009. Furthermore, firms' size slightly increases in the retail sector surrounding and during the financial crisis, while it increases and declines in the mining sector. These results highlight a resilience of retail firms and their ability to continue their

investments and growth despite the financial shock, while firms in the mining sector faced troubles to maintain their activities steady. This result shows the importance for firms to have sufficient cash and reserves to continue their growth and investments, and hence, take a competitive advantage during a recovery period, as Joseph et al. (2020) demonstrate.

We observe a significant decline of cash flow during and after the crisis for mining firms, Moreover, Ebit significantly declines during and after the crisis in the mining sector. Both results suggest very weak performance and financial troubles in earnings surrounding the recent financial crisis period. Furthermore, a negative cash flow suggests that mining firms could use it as a substitute to pay debts and hence, reveals a potential cash shortage due to this weak performance (Opler et al. 1999). Furthermore, cash flow is an important internal financing resource and hence, a negative cash flow can affect investment negatively (Love and Zicchino, 2006). In the retail sector, Ebit and Cash flow increase during and after the crisis. Therefore, retail firms perform well.

We observe a significant increase of liquidities during and after the crisis in the mining sample. This result confirms that mining firms faced financial troubles and faced a cash shortage. Furthermore, it seems mining firms compensate their cash shortage and weak performance results by increasing their liquidity and short-run assets to convert it into cash rapidly. However, a high level of liquidity is detrimental for competitiveness and growth (Shiau et al. 2018). Moreover, it highlights a non-use of external financing sources, such as debts, especially after the crisis.

Although the liquidity ratio is high in the retail sector, it remains steady and shows an efficient management of liquidity from retail corporates to avoid a cash shortage. In other words, firms can hold more liquid assets to make sure they can resist to shocks and finance their activities through their internal financing resources instead short-term debts. Furthermore, we can see a leverage superior to 0.5 during and after the crisis in the retail sector. Therefore, corporates finance their activities through equity and working capital. Hence, shareholders continue to invest and support retail economic activities. Consequently, retail firms did not use debts during the crisis and prefer internal financing resources and equity. Therefore, it is logic to see that these firms continue to pay dividends, even during the crisis and significantly after. Furthermore, it supports the precautionary motive according to which firms increase their leverage surrounding a crisis period (Kim et al. 2011). However, leverage increases before and during the crisis, and significantly declines after the shock in the mining sector. Therefore, mining firms face difficulties to finance their activities through

equity and debts, especially after the financial turmoil. Since economic performance of these firms after the crisis is poor, this result is logical. Moreover, mining companies do not pay dividends during the crisis and significantly reduce their dividends afterwards, probably to save cash (Opler et al. 1999). However, it leads to a loss of shareholders' confidence.

Table 3: average values of selected variables.

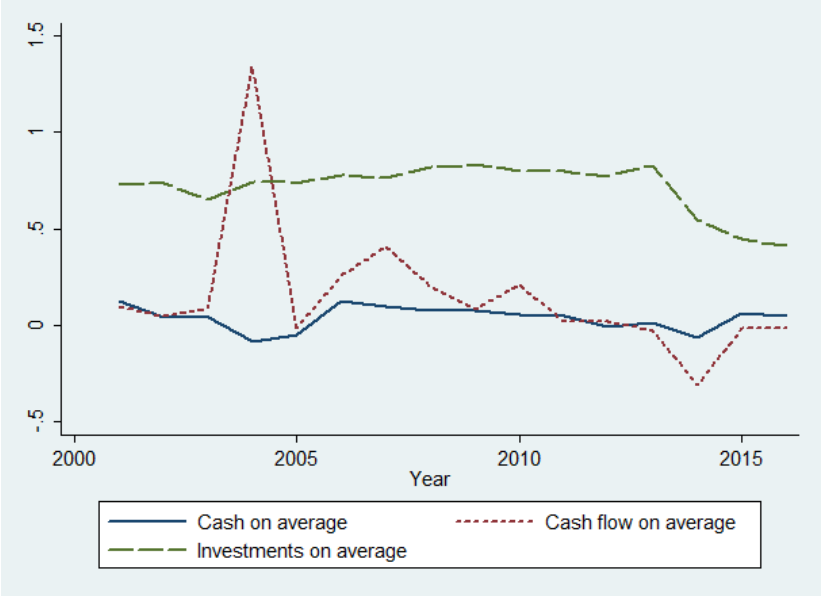
	Pre-crisis period 2001-2006 Mean	Crisis period 2007-2009 Mean	Post-crisis 2010-2016 Mean	Overall period 2001-2016 Mean
		Firms in the mining sector		
Cash	0.033	0.083	0.022	0.037
Size	6.609	7.192	6.934	6.855
EBIT	0.247	0.201	-0.102	0.085
Cash-Flow	0.307	0.231	-0.017	0.149
Investment	0.726	0.805	0.657	0.712
Leverage	0.505	0.582	0.347	0.45
Liquidity	1.319	2.85	8.451	4.721
Dividends	153545.7	0	3719.527	58468.73
		Firms in the retail sector		
Cash	0.132	0.134	0.119	0.127
Size	5.961	6.275	6.512	6.261
EBIT	0.093	0.131	0.106	0.106
Cash-Flow	0.135	0.164	0.142	0.143
Investment	0.573	0.581	0.594	0.584
Leverage	0.365	0.606	0.546	0.489
Liquidity	2.125	2.045	2.065	2.084
Dividends	1605.5	23.467	2222.857	1578.963

Source: author's computations.

The following figures (14 and 15) plot the trend of cash, cash flow, and investments, on average, in both sectors. Unsurprisingly, we report a decline of investments for mining firms after the crisis. Furthermore, cash and cash flow (and Ebit, see table 3) continue to decline after 2005 and prevent companies to use internal financing resources to invest. Moreover, cash flow seems to be volatile in the mining sector. Apparently, these firms face more difficulties to have access to external financing sources, equity, and debts. Consequently, they face a cash shortage after the crisis and it generates these issues. In contrast, firms in the retail

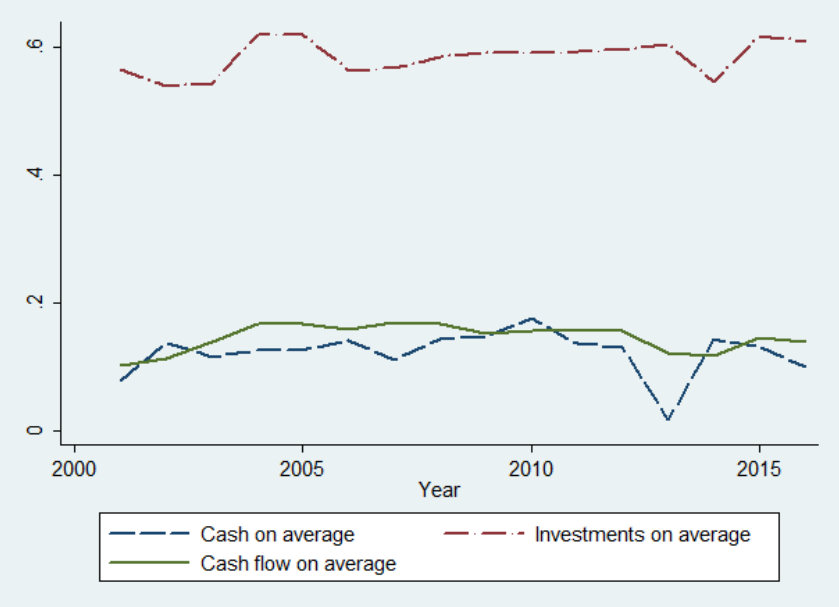
sector continue to invest surrounding the crisis. Their high amount of cash and liquidity allow them to use their internal funds. Furthermore, they finance their investments by using equity and not debts and continue to pay dividends. Figure 15 highlights a reduction of cash after the crisis but cash flow remains steady. Consequently, retail firms can continue to invest.

Figure 14: Mining sector, cash, cash flow & investments.



Source: author's computations

Figure 15: Retail sector, cash, cash flow & investments.



Source: author's computations

4.2 Correlation Matrix.

The following tables report the correlation between our variables of interest. Globally, correlations are less than 0.5. According to Chireka and Fakoya (2017), this means that the model does not suffer of multicollinearity.

In the mining sector, results highlight a positive correlation between cash size, investment, liquidity, and dividends. Firms hold cash at each step of their development. Dividends are positively correlated to cash, cash flow and Ebit. Hence, bad performance obliges firms to reduce their dividends. Cash flow has a negative correlation with cash. Hence, corporates use it to pay debts when they face a cash shortage. This outcome reports financial difficulties (Naumoski, 2018). Finally, investments have a positive correlation with cash, Ebit and cash flow. Hence, firms need to perform to continue to invest.

In the retail sector, cash is positively correlated to Ebit, and cash flow. Furthermore, investments are positively correlated to cash, Ebit, cash flow and liquidity. However, investments have a negative correlation with leverage. Hence, firms invest regarding their internal financing resources.

Commonly, investment and dividends are positively correlated to cash in both sectors. Hence, firms need cash to invest and pay dividends. Chireka and Fakoya (2017) find similar results. Moreover, we can see a positive correlation between investment and cash flow. Hence, a decrease of cash flow reduces investments and vice-versa (Shiau et al. 2018). Nevertheless, the correlation is higher in the mining sector than the retail sector.

Table 4: Correlation Matrix, mining sector, overall period

	Cash ratio	size	Ebit	CF	Investment	Leverage	Liquidity	Div dummy
Cash ratio	1							
size	0.452	1						
Ebit	-0.075	0.002	1					
CF	-0.174	-0.032	0.987	1				
Investment	0.349	0.293	0.257	0.197	1			
Leverage	0.0004	-0.125	0.002	-0.007	-0.08	1		
Liquidity	0.062	-0.171	0.012	0.003	0.106	-0.040	1	
Div dummy	0.121	0.052	0.031	0.028	0.023	-0.04	-0.054	1

Source: author's computation

Table 5: Correlation Matrix, retail sector, overall period

	Cash ratio	size	Ebit	CF	Investment	Leverage	Liquidity	Div dummy
Cash ratio	1							
size	-0.06	1						
Ebit	0.451	0.159	1					
CF	0.527	0.08	0.846	1				
Investment	0.099	-0.087	0.158	0.267	1			
Leverage	-0.105	0.107	-0.055	-0.04	-0.028	1		
Liquidity	-0.04	-0.447	-0.064	-0.029	0.688	-0.499	1	
Div dummy	0.075	0.02	-0.001	0.132	0.069	-0.166	-0.261	1

Source: author's computations

4.3 Random and fixed effect, results.

We regress for the period before the crisis, during the crisis, after the crisis, and for the overall period. Table 6 provides the results.

In the retail sector and under the random effect, we find a negative and significant correlation between size and cash. We also report a negative and significant correlation before and during the crisis. Therefore, we reject the third hypothesis, and this result is consistent with the trade-off theory**.** Bigelli and Sanchez-Vidal (2012) argue that larger firms are less affected by the risk of bankruptcy and therefore, they can hold less cash. In our case, firms in the retail sector continue to growth despite the crisis and can hold less cash. It is relevant to notice that the coefficient is low. Hence, firms slowly reduce their cash as they continue to growth. Furthermore, leverage (table 2) increases surrounding the crisis for retail firms. According to Ferreira and Vilela (2004), a negative correlation between firm's size and cash plus an increase of leverage reveals a certain facility to get access to the financial market. This result supports our previous observations. However, results are not significant under the fixed effect.

In the mining sector, Ebit is positively and significantly correlated with cash for the overall period under the random effect. The coefficient value reports the importance of Ebit as an internal financing resource for mining firms. Hence, a decline of economic performance affects cash negatively. Shiau et al. (2018) also find the same results in Asia. This outcome supports the pecking-order theory and transactional motive. We find the same result under the fixed effect and the coefficient value is almost the same. Results are not significant when we regress between the different periods. For retail firms, we find a negative and significant correlation between cash and Ebit after the crisis under the random effect. However, this

result is not significant for the overall period. Moreover, we observe a significant and positive correlation before the crisis under the fixed effect.

Cash flow is negatively and significantly correlated with cash in the mining sector under the random effect. Hence, we cannot reject the fifth hypothesis. Arora (2019) and Kim et al. (2011) show a negative relationship between cash flow and cash, especially when firms use cash flow instead cash to pay debt or to face financial difficulties. Hence, this outcome is consistent with the trade-off theory (Opler et al. 1999) and supports our previous observations. Furthermore, Naumoski (2018) argues that a positive correlation between cash and cash flow reports a certain free in terms of investments. In other words, firms are not constrained by their environment and they can invest easily. Therefore, a negative correlation could suggest the opposite. For firms in the retail sector, we find a significant and positive relationship between cash flow and cash. Hence, we reject the fifth hypothesis for this sector. This result supports the pecking-order theory (Myers and Majlul, 1984) and the argument of Naumoski (2018) above. Moreover, it supports the previous observation according to which firms in the retail sector continue to invest despite the crisis. The coefficient value for both sector is important, compared to other coefficient, especially after the financial turmoil. Hence, cash flow is a decisive internal financing resources for firms and significantly affect cash. We find the same result under the fixed effect for the overall period. However, we report a significant and positive correlation between cash flow and cash after the crisis under the fixed effect for both sectors. The coefficient value is particularly high in the retail sector.

For investments, the coefficient value is highly significant before the crisis for retail firms but remains not significant for the overall period. Under the fixed effect, coefficient value of investments is negative after the crisis for both sectors. Nevertheless, this outcome is not significant for the overall period. In the mining sector, the coefficient value is negative after the crisis. Hence, mining and retail firms face difficulties to continue to invest after the financial turmoil, under the fixed effect (Opler et al. 1999). We also report a negative correlation between investments and cash for retail firms before the crisis under this effect.

Under the random effect, leverage coefficient is significant and positive in the retail sector during the crisis, under the random and fixed effect. Hence, firms raise cash through equity and were able to have access to the credit market. Therefore, they are more resilient. Nevertheless, this outcome is not significant for the overall period. We do not find significant result under the fixed effect, and for the mining sector. Considering the overall period, we cannot reject the fourth hypothesis. In the mining sector and under the random effect, we

show a negative and significant correlation between cash and dividends after the crisis. The coefficient value is extremely high. Thus, mining firms significantly reduce dividends payment after the crisis to face their cash shortage. We find the same outcome under the fixed effect. However, the random effect reports a positive and significant correlation between cash and dividends for the overall period, while the result is not significant under the fixed effect. In the retail sector, we find a negative and significant correlation between dividends and cash before the crisis, under the fixed effect. Considering the overall period, we cannot reject the first hypothesis under the random effect. Chireka and Fakoya (2017), Ozkan and Ozkan (2004), and Kim et al. (2011) also find a positive correlation. Hence, firms hold cash to pay the shareholders. This result is consistent with the trade-off theory and the precautionary motive. This policy acts as a positive signal for shareholders, especially when a crisis occurs. If firms fail to pay dividends, their business core value may decline significantly, especially when the financial environment is uncertain. In other words, firms want to conserve shareholders' confidence and stabilize their business value by paying dividends (Chireka and Fakoya, 2017). However, mining firms do not pay dividend during the crisis, but before and after. Furthermore, they significantly reduce dividends payment after the financial turmoil. Hence, the interpretation is tricky, and the pecking-order theory should be considered. In that case, firms stop to pay dividends to save cash because they face financial difficulties (Opler et al. 1999). Finally, we find a negative correlation between cash and liquidity in the retail sector under the random effect. Hence, retail firms use it to raise cash quickly. We also find a negative correlation before the crisis. Nevertheless, this result is not significant under the fixed effect. For mining firms, outcomes are significant and positive under the fixed effect for the overall period and after the crisis, while it is highly significant and positive under the random effect. Such a result is not supported in the academic literature. Indeed, according to Chireka and Fakoya (2017), a negative correlation between cash and liquidity is empirically well supported and means that firms with a high amount of liquid assets hold less cash. This result contradicts the trade-off theory and reports potential agencies costs (Chireka and Fakoya, 2017). However, mining firms would make sure they have sufficient liquidities due to difficulties to get access to external financing sources and their weak economic performance. According to us, it reveals bad economic performance and cash shortage.

Table 6: Random effect

	2001-2006		2007-2009		2010-2016		2001-2016	
	Mining	Retail	Mining	Retail	Mining	Retail	Mining	Retail
Size	0.088	-0.045***	0.0138	-0.0234**	0.019	0.011	0.056	-0.018 ***
	(0.0592)	(0.007)	(0.021)	(0.012)	(0.008)	(0.0091)	(0.042)	(0.005)
Ebit	-0.229	0.072	-1.472	0.284	-0.206**	-0.742**	0.661***	0.045
	(0.226)	(0.051)	(1.934)	(0.80)	(0.098)	(0.310)	(0.172)	(0.053)
CF	0.15	0.17**	1.490	0.20	0.807***	1.517***	-0.730***	0.575***
	(0.226)	(0.083)	(1.941)	(0.805)	(0.158)	(0.287)	(0.182)	(0.066)
Investment	0.207	0.145***	-0.061	-0.029	-0.024**	-0.0631	0.005	0.008
	(0.181)	(0.055)	(0.276)	(0.05)	(0.009)	(0.050)	(0.05)	(0.023)
Leverage	-0.052	-0.161	0.095	0.249**	0.0080	-0.034	0.003	-0.03
	0.144	(0.115)	(0.080)	(0.10)	(0.0078)	(0.029)	(0.021)	(0.024)
Liquidity	0.033	-0.0302***	0.0004	-0.002	0.00059***	0.0066	0.001	-0.0063 **
	(0.023)	(0.005)	(0.0034)	(0.015)	(0.00016)	(0.0052)	(0.00051)	(0.0029)
Dividend dummy	0.071	-0.045***	0	0.07	-0.797***	0.0027	0.092***	-0.004
	(0.048)	(0.0139)		(0.055)	(0.0772)	(0.0078)	(0.032)	(0.01)
Constant	-0.716***	0.421***	-0.072	0.078	-0.0976	-0.0499	-0.315	0.177***
Number of observations	78	60	39	30	91	70	208	160
Number of firms	13	10	13	10	13	10	13	10
Prob > chi2	0	0	0.0723	0	0	0	0	0
R square	0.729	0.898	0.253	0.8845	0.969	0.949	0.748	0.918

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

Table7: Fixed effect

	2001-2006		2007-2009		2010-2016		2001-2016	
	Mining	Retail	Mining	Retail	Mining	Retail	Mining	Retail
Size	0.093	-0.028	-0.0064	0.078	0.051	0.130	0.0248	-0.002
	(0.143)	(0.0857)	(0.018)	(0.0915)	(0.0574)	(0.122)	(0.0527)	(0.0119)
Ebit	0.113	0.1879***	0.645	0.7613	-0.177	-0.823	0.6705***	0.0511
	(0.088)	(0.053)	(3.047)	(1.118)	(0.128)	(0.668)	(0.168)	(0.0376)
CF	-0.177*	-0.073	-0.647	-0.0976	0.7509***	1.848**	-0.737***	0.691***
	(0.089)	(0.330)	(3.061)	(0.947)	(0.217)	(0.7906)	(0.179)	(0.1587)
Investment	-0.235	-0.326**	-0.220	-0.447	-0.0450**	-0.459**	-0.025	-0.038
	(0.245)	(0.124)	(0.3075)	(0.484)	(0.016)	(0.2909)	(0.0327)	(0.0677)
Leverage	0.179	-0.210	0.0254	0.280*	0.003	-0.014	0.001	-0.032
	(0.2054)	(0.191)	(0.059)	(0.149)	(0.0059)	(0.017)	(0.020)	(0.0235)
Liquidity	0.0043	0.0293	0.0008	0.0030	0.0013***	0.0014	0.0012***	0.00015
	(0.0339)	(0.0215)	(0.0009)	(0.020)	(0.0003)	(0.0071)	(0.00037)	(0.0033)
Dividend dummy	-0.0126	-0.077**	0	0	-0.697***	-0.0024	0.0478	-0.0173
	(0.075)	(0.026)			(0.0814)	(0.00956)	(0.0526)	(0.0153)
Constant	-0.482	0.511	0.309	-0.361	-0.313	-0.6305	-0.0715	0.0818
Number of observations	78	60	39	30	91	70	208	160
Number of firms	13	10	13	10	13	10	13	10
Prob > chi2	0	0.000	0.00	0.1008	0	0.0003	0	0.000
R square	0.36	0.032	0.289	0.005	0.933	0.093	0.706	0.795

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

Table 8 shows our results for mining and retail sector. We include a dummy variable to capture the period after the crisis, following the framework of Shiau et al. (2018). As we can see, coefficients of CF dummy are not significant in both sectors. However, mining firms are significantly and positively correlated by cash flow and cash. Therefore, these financial indicators are important in investments' decisions. In the retail sector, our results are not significant and hence, retail firms invest regarding other indicators. These outcomes explain why mining firms face difficulties to invest after the shock.

Table 8: dummy variable to capture investment sensitivity after the crisis.

	Random		Fixed	
	Mining	Retail	Mining	Retail
CF	0.1093***	-0.0386	0.1091***	-0.0618
	(0.0103)	(0.1676)	(0.0081)	(0.1792)
CF dummy	-0.044	0.0175	-0.053	0.017
	(0.128)	(0.0328)	(0.1345)	(0.0327)
Cash	0.745***	-0.0315	0.416***	-0.029
	(0.117)	(0.066)	(0.093)	(0.0685)
Constant	0.6876***	0.585***	0.703***	0.5886***
Number of firms	13	10	13	10
Number of observations	208	160	208	160
R-square	0.6892	0.1299	0.6058	0.1330
Prob > Chi 2	0	0.8870	0.0000	0.8331

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

In table 9 cash and cash flow appear as crucial for mining firms during and after the crisis. More specifically, coefficient value of cash flow is higher during the post crisis period. Hence, this internal fund is extremely important during the recovery period in investments' decisions. Also, this result is supported by Shiau et al. (2018) and Arslan et al. (2006). Indeed, they establish that investment cash flow sensitivity significantly increases after a crisis for financial constrained companies. According to Shiau et al. (2018), this result shows a significant effect of the crisis on cash flow. In other words, this internal financing resource becomes more volatile and therefore, mining firms have to reduce their investments after the crisis. This outcome is logical since we have seen a significant decline of investments of these firms after the crisis in the descriptive part.

Table 9: OLS without dummy, investment cash flow and cash sensitivity

	2001-2006		2007-2009		2010-2016	
	Mining	Retail	Mining	Retail	Mining	Retail
			Random			
CF	0.023	0.0879	0.0718***	-0.395*	0.472**	0.041
	(0.019)	(0.174)	(0.0208)	(0.207)	(0.212)	(0.146)
Cash	0.068	-0.083	-0.147	0.117*	0.454	-0.1636**
	(0.148)	(0.08)	(0.158)	(0.0646)	(0.37)	(0.071)
Constant	0.724***	0.572***	0.801***	0.636***	0.655***	0.6075***
Observations	91	60	39	27	91	70
R-square	0.4499	0.011	0.0053	0.1365	0.8631	0.2027
Prob > Chi 2	0	0.3105	0	0.0804	0	0.07

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

Table 10 shows our results under the fixed effect. Cash flow is significantly and positively correlated to investment during the crisis for mining firms.

Table 10: Investments' cash flow sensitivity, fixed effect

	2001-2006		2007-2009		2010-2016	
	Mining	Retail	Mining	Retail	Mining	Retail
			Fixed			
CF	0.0070	0.0698	0.0655***	-0.3507	0.446	0.0067
	(0.008)	(0.1918)	(0.0158)	(0.230)	(0.501)	(0.1638)
Cash	-0.079	-0.082	-0.375	-0.134	-0.402	-0.162*
	(0.099)	(0.079)	(0.225)	(0.192)	(0.991)	(0.074)
Constant	0.73***	0.574***	0.821***	0.6619***	0.674***	0.612***
Observations	78	60	39	27	91	70
R-square	0.06	0.0101	0.0002	0.2327	0.8392	0.1917
Prob > Chi 2	0.000	0.3375	0.000	0.3025	0.000	0.1079

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

Regarding the overall period (table 11), cash and cash flow pay a key role to invest for mining firms. Indeed, coefficients are positive and highly significant, while it is not the case for retail firms. Hence, these indicators are decisive in investment decisions differ between sectors.

Table 11: overall period, investments' cash flow sensitivity

	2001-2016		2001-2016	
	Mining	Retail	Mining	Retail
	Random		Fixed	
CF	0.1115***	-0.036	0.111***	-0.0599
	(0.0151)	(0.165)	(0.0094)	(0.177)
Cash	0.7512***	-0.0387	0.427***	-0.0364
	(0.1312)	(0.074)	(0.113)	(0.0757)
Constant	0.667***	0.593***	0.679***	0.596***
Observations	208	160	208	160
R-square	0.688	0.1279	0.6057	0.1317
Prob > Chi 2	0	0.7136	0	0.6493

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

4.4 VAR, OIRF, and FEVD, results.

Table 12 and 13 report our VAR (1) result for the mining and retail sector respectively.

Table 12: Mining sector, VAR (1)

	CFt-1	KEAt-1	Constant
CF	-0.449**	-2.315*	-0.054
	(0.2045)	(1.187)	
KEA	-0.0034	-0.0282	-0.0239
	(0.0474)	(0.275)	
Observations	14		

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

Table 13: Retail sector, VAR (1)

	CFt-1	KEAt-1	Constant
CF	0.486**	-0.316***	0.0014
	(0.241)	(0.11)	
KEA	1.5613***	-0.632***	0.0025
	(0.4657)	(0.213)	
Observations	14		

*Standard error in (), *** significant at 0.01, ** significant at 0.05, * significant at 0.1*

In the retail sector, our VAR (1) results show a significant correlation between investments in t and cash flow in t-1. Furthermore, coefficient value is positive and high. This result is expected. If cash flow increases in t-1, investments will significantly increase in t. On the other hand, there is a negative and significant correlation between cash flow in t and investments in t-1. Hence, if investments are reduced in t-1, cash flow should increase in t. This result is logical since firms decrease their investments to save cash (Opler et al. 1999). Love and Zicchino (2006) find similar results. All outcomes in the retail sector are highly significant. In the mining sector, our VAR (1) shows a negative correlation between investments in t and cash flow in t-1. However, this result is not significant, and the coefficient value is almost null. We also report a negative and significant correlation between cash flow in t and investments in t-1. The coefficient value is very high and reveals that corporates significantly reduce their investments to increase their cash flow.

Figures 16 and 17 report our OIRF outcomes. In the mining sector, figure 16 reports a negative response of KEA to a standard deviation of CF, from period zero to period one. In the following periods, KEA does not react to CF. On the other hand, cash flow negatively reacts to a shock on investments from period zero to period one, and period three to four. Nevertheless, we observe a positive reaction of CF to a standard deviation of KEA from period two to period three. However, confidence intervals show that our results are not significant. In the retail sector, figure 17 reports a positive response of KEA to a shock on CF. For one standard deviation of CF, we observe a response of 0.02 on KEA. On the other hand, CF has a negative response to a standard deviation of KEA. For a one standard deviation of KEA, we observe a response of less than -0.01 on CF. These results report different reactions

between mining and retail firms in terms of investments, regarding a standard deviation of their cash flow.

Figure 16: OIRF, Mining sector

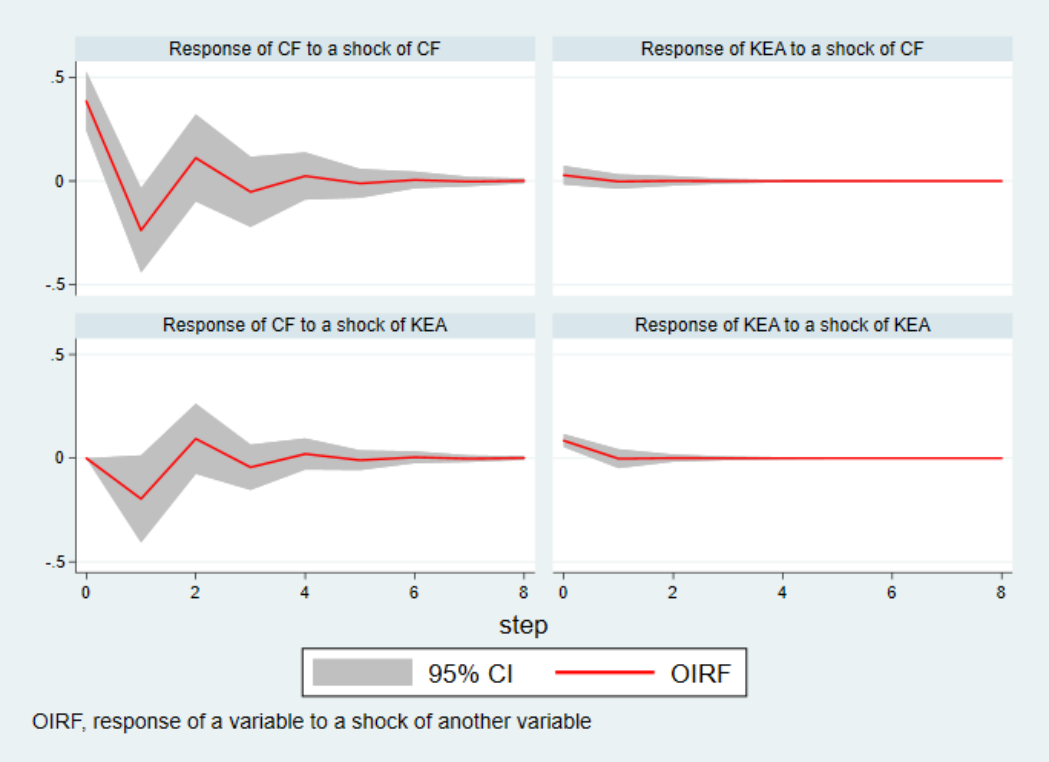
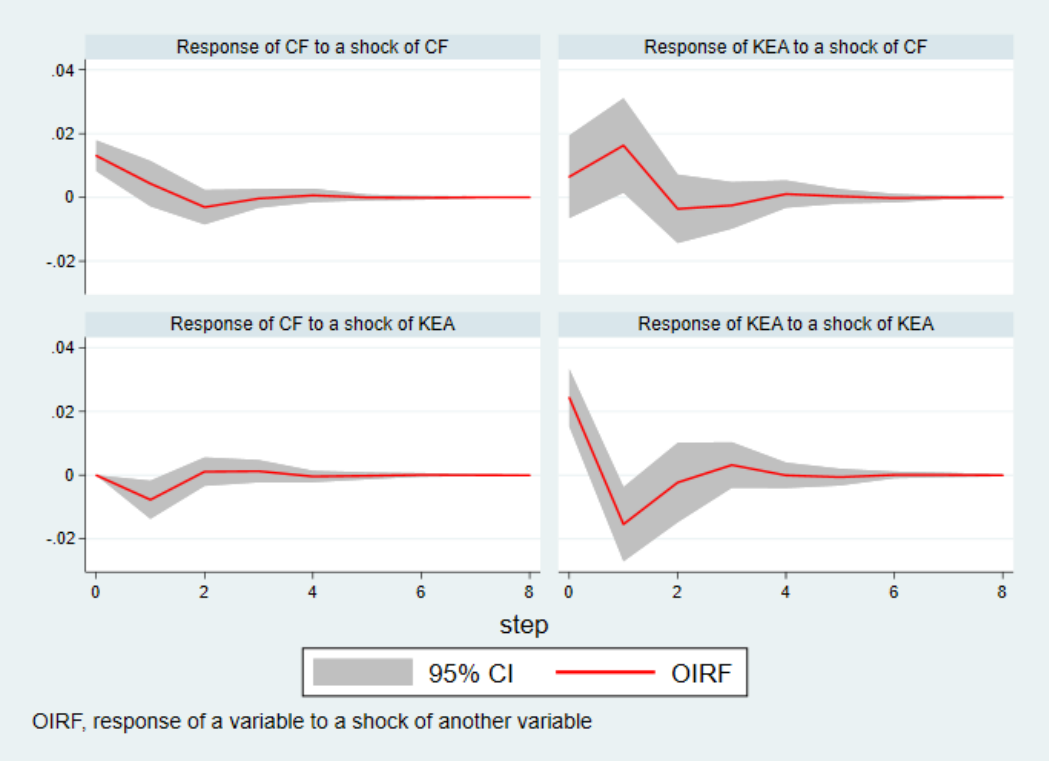


Figure 17: OIRF, Retail sector



In the mining sector, table 14 shows that CF explains 10% of variations in terms of KEA. Nevertheless, a shock on KEA generates a higher variation of CF. In the retail sector, a shock on CF explains more than 20% of investments' response (table 15).

Table 14: variance decomposition, mining sector

Period	FEVD, Impulse CF, response KEA	FEVD, Impulse KEA, response CF
0	0	0
1	0.0984	0
2	0.0988	0.158
3	0.0989	0.1789
4	0.0989	0.183
5	0.0989	0.1838
6	0.0989	0.184
7	0.0989	0.18409
8	0.0989	0.1841

Table 15: variance decomposition, retail sector

Period	FEVD, Impulse CF, response KEA	FEVD, Impulse KEA, response CF
0	0	0
1	0.066	0
2	0.271	0.238
3	0.278	0.233
4	0.279	0.2381
5	0.2793	0.2382
6	0.28	0.238
7	0.28	0.2384
8	0.2801	0.2384

Conclusion of the empirical part

In this empirical part, we first analyse cash holdings in retail and mining firms in South Africa surrounding the recent crisis. Following the framework of Shiau et al. (2018), we make use of a panel OLS with fixed and random effect models. We regress before, during, after, and during the overall period surrounding the financial turmoil. We obtain different outcomes between these sectors. To sum up, firms in the mining sector show a precautionary behaviour surrounding the crisis, especially during and after the shock. Indeed, dividends are not paid during the crisis and mining firms use cash flow to pay debts because of a cash shortage and hence, are not able to invest because they must save cash. On the other hand, retail firms have a high level of cash and liquidities before the crisis and results show a good capacity to maintain steady activities and to invest, even during and after the crisis. Hence, these firms do not adopt a precautionary behaviour surrounding the crisis period in terms of cash holdings.

Thereafter, we analyse investments' sensitivity to cash and cash flow in both sectors after the crisis and surrounding the financial turmoil. We apply a dummy variable to capture the period after the crisis. A positive and significant correlation shows a high investments' cash flow sensitivity (Chiau et al. 2018). Our first regression with the dummy variable does not provide significant results in both sectors. However, results report a significant and positive correlation between these internal financing sources and investments when we remove the dummy variable. Considering the overall period, cash and cash flow are positive and highly significant in the mining sector. In the retail sector, our results are not significant.

To depict investments' response to a shock on an internal financing resource, we follow the framework of Love and Zicchino (2016). We make use of a vector autoregressive with one lag, an orthogonalized impulse response function, and variance decomposition. We show a positive and significant response of investments to cash flow in the retail sector, a one standard deviation of cash flow generates a response of 0.02 on investments. On the other hand, a one standard deviation of investments induces a response less than -0.01 on cash flow. Results are not significant in the mining sector. The variance decomposition shows a variation of 28% of investments to a standard deviation of the cash flow in the retail sector, while it is 10% in the mining sector. These outcomes confirm the importance of internal funds in terms of investments and hence, firms' competitiveness surrounding a financial crisis.

General conclusion

This thesis examines corporate cash holdings and investments in South Africa surrounding the recent global crisis.

In the first part, we depict macroeconomic consequences of the subprime crisis in South Africa. We report that South Africa experienced a global economic recession, and the demand shock dominated the economy (Moroke et al. 2014; Ncube et al. 2016). Thereafter, we explain the two main transmission channels: trade channels and financial channels. The former highlights the dependency of South Africa on the United States in terms of trade. Therefore, the risk of transmission shock is pervasive. The latter reports the liberalization of the financial channels and the rise in foreign investments. However, several problems persist such as high concentration in the banking system and asymmetry of information. Consequently, a financial crisis prevents bank dependent firms from having credits. Therefore, they need to use internal financial resources to face the shock (Aron and Muellbauer, 2000; Madubeko, 2010 and Nyamgero, 2015). Thereafter, we discuss the monetary policy and its effectiveness. We highlight that, under the inflation targeting regime, a negative aggregate demand shock forces the monetary institution to reduce policy rate. Consequently, the economy goes back to its equilibrium through consumption and investments (Blanchard and Gali, 2007; Ellyne and Veller, 2011). However, the monetary policy in South Africa is threatened by the high concentration of the banking market. Hence, when the Central Bank changes its policy rate, commercial banks let their rate unchanged, which supports asymmetry of information and lack of capital allocation. In other words, the credibility of the Central Bank is dominated by the uncertainty (Matemilola et al. 2015). We also discuss the consequences of the crisis for the national government. To conclude this first section, we notice political and social fallout due to the crisis (Steytler and Powell, 2010).

In the second part, we highlight theoretical and empirical outcomes of cash holdings and investments. We explain the main theories and motives for holding cash surrounding a crisis and their empirical demonstrations. We observe firms tend to reduce their investments and dividends to save cash. Moreover, accessing the credit market is complicated and firms tend to use more internal resources to save cash. Even for large firms in South Africa, they hold cash during their development to ensure they will not face a shortage. Furthermore, firms tend to hold liquidities to raise cash rapidly (Chireka and Fakoya, 2017; Chireka, 2020; Opler et al. 1999; Shiau et al. 2018). However, other theories, such as the trade-off theory, show that

firms can use cash to pay dividends even surrounding a financial crisis period. Accordingly, these firms want to send a positive signal to shareholders and to control their business value. They can also use cash flow to pay debts and costs (Chireka and Fakoya, 2017; Opler et al. 1999). In this case, these firms face difficulty investing. Moreover, leverage is also considered to be crucial and is expected to increase surrounding a financial crisis period. All these theories and empirical results show the importance of internal financial resources and cash surrounding a crisis. In other words, cash holdings and investments depend on firms' characteristics and macroeconomic factors (Shiau et al. 2018; Love and Zicchino, 2016).

In the third section, we provide our methodologies and data explanations. We collected data on 13 mining firms and 10 retail corporates. We made use of a panel OLS with fixed and random effect model to depict cash holdings and investments' cash flow and cash sensitivity surrounding the financial crisis. Thereafter, we used a vector autoregressive and an orthogonalized impulse response function to depict investment reaction to internal financing source.

The fourth and last part reports our empirical outcomes. We highlight a reduction in dividends payment during and after the crisis, a negative correlation between cash flow and cash and a positive correlation between cash and Ebit, in the mining sector. Hence, a negative relationship between cash flow and cash shows financial constraint to invest because companies use cash flow to pay debt, due to a cash shortage (Opler et al. 1999). Our results report financial difficulties for mining firms, during and especially after the crisis. We also observe a positive and significant correlation between firms' size and cash. This result shows difficulties for mining firms to finance their growth. In the retail sector, there is a positive and significant correlation between cash and cash flow. According to Naumoski (2018), this result shows a certain capacity for firms to invest. Furthermore, there is a negative correlation between firms' size and cash, which facilitate their access to financial markets. Consequently, firms can finance their growth (Bigelli and Sanchez-Vidal, 2012).

We also depict investment sensitivity to crucial internal financing resources (i.e., cash and cash flow) after the crisis and surrounding the financial turmoil, following the framework of Shiau et al. (2018). To capture the post-crisis period, we apply a dummy variable on cash flow. Nevertheless, results are not significant for this variable. For the overall period, we highlight a significant and positive correlation between cash, cash flow and investments, in the mining sector, while results are not significant in the retail sector. Hence, these internal

financing sources are crucial to motivate firms to invest especially when facing a financial turmoil. In other words, a shortage of cash and cash flow leads corporates to financial difficulties.

Thereafter, we depict investment response to a shock on cash flow. We make use of a vector autoregressive, an orthogonalized Impulse Response function, and a variance decomposition. Our outcomes show a significant and positive reaction of investments to a shock of cash flow in the retail sector, while results are not significant in the mining sector. They highlight the importance of having internal financing sources and especially, cash flow to preserve firms' competitiveness surrounding a financial crisis period. Love and Zicchino (2006) and Joseph et al. (2020) also support these outcomes.

5.1 Limitations

The size of both samples is too small and hence affects results and interpretations. Moreover, outcomes can be different, depending on proxies' variables and data availability. Furthermore, other variables should be considered in the OLS model or in the Impulse Response Function. Our results cannot be generalized.

5.2 Recommendations

Most empirical studies on cash holding and investment use OLS, except for Joseph et al. (2020) or Love and Zicchino (2006) and ours. It is therefore interesting to use other empirical models, such as Local Projection (Jorda, 2005) or Impulse Response Function, to examine how cash and investments may react to a shock on internal financing resources.

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